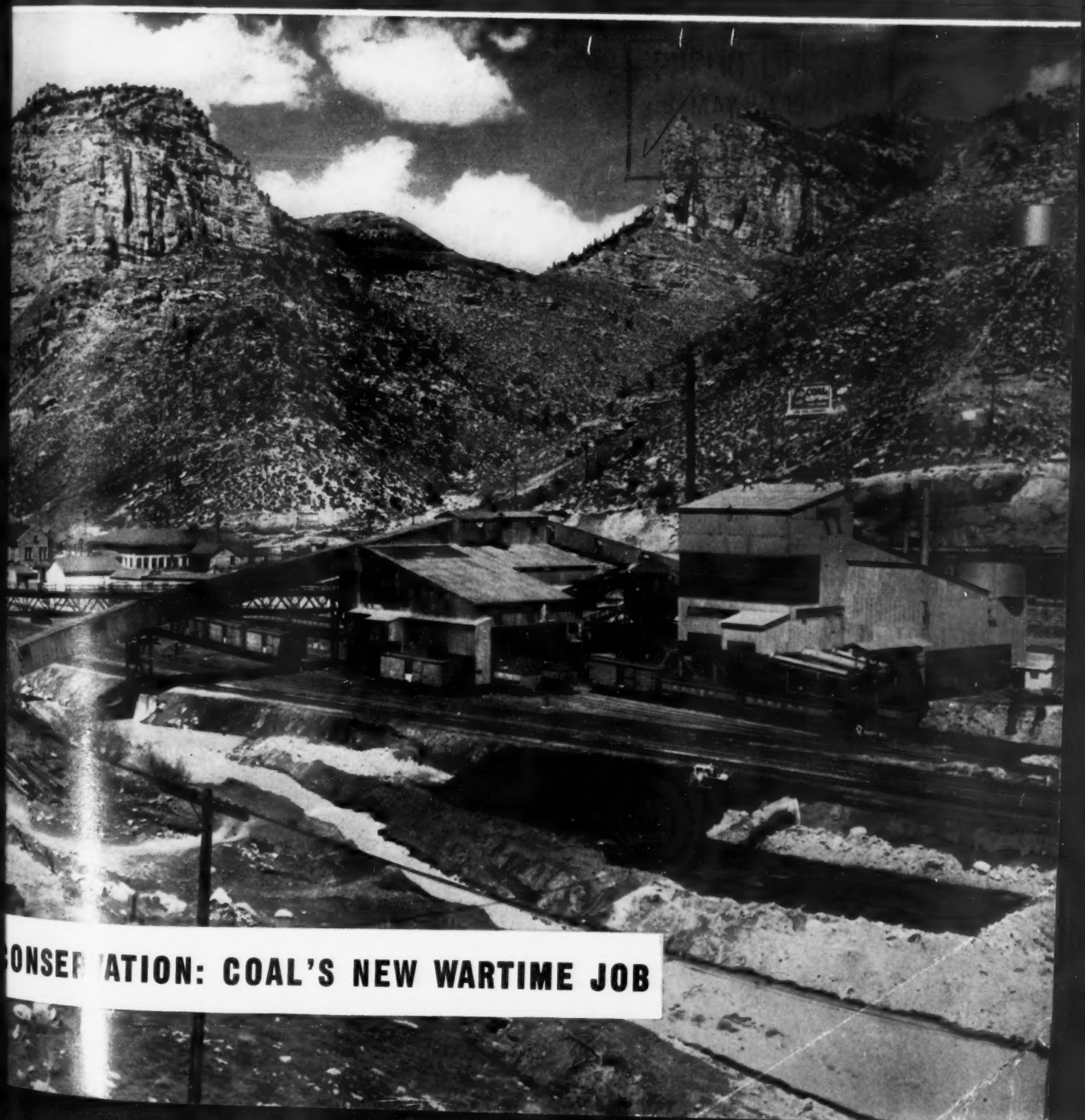
Coal Age

MAY, 1944



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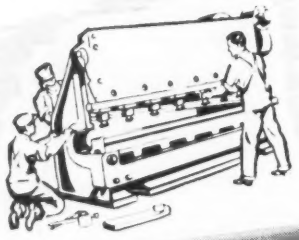
THIS NEW LUBRICATION PLAN Provides a *3 Way Saving!*

① SAVES EQUIPMENT

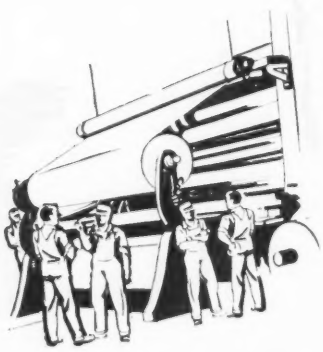
Today, with many types of equipment almost impossible to replace, conservation through proper lubrication is of prime importance. Sun's SAVE and SERVE Plan has been developed to help you make the equipment in your plant run better and last longer . . . by helping you establish a system of proper lubrication.

② SAVES PRODUCTIVE TIME



Every breakdown of equipment wastes productive time. Sun's SAVE and SERVE Plan helps you cut down these wasteful periods — when valuable machinery must stand idle unnecessarily — and increases the actual productive time you can expect from your equipment.

③ SAVES LABOR



Reduce your maintenance time . . . cut your repairs and you save manpower.

Sun's SAVE and SERVE Plan will help you do both — help you make every man-hour a productive hour — by giving you a guide to correct lubrication that anyone can follow. Put Sun's SAVE and SERVE Plan to work in your plant. No charge. It's yours for the asking — includes plant poster, wall chart, lubrication manual, technical bulletins, maintenance memos. Write for folder giving complete details . . .

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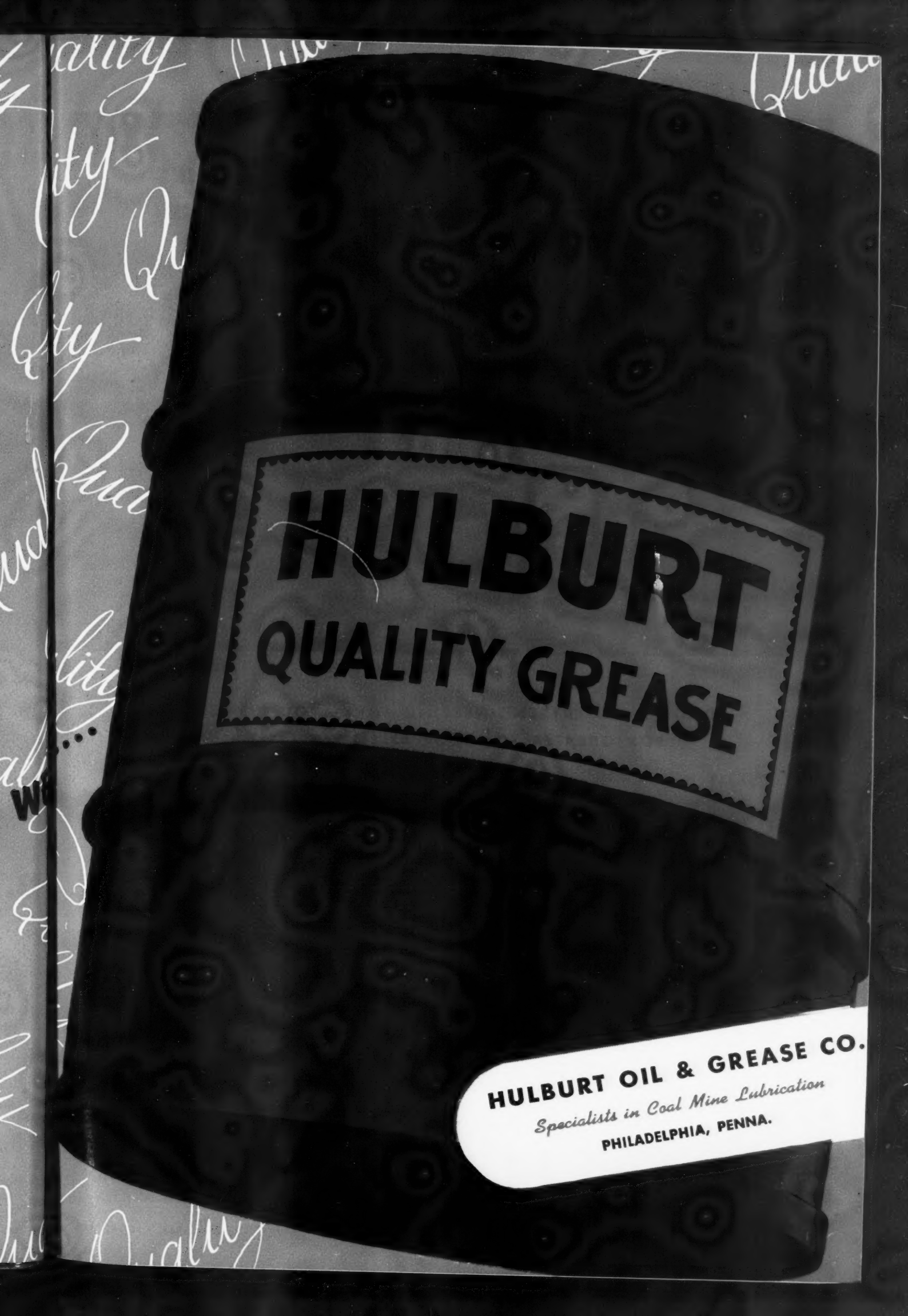
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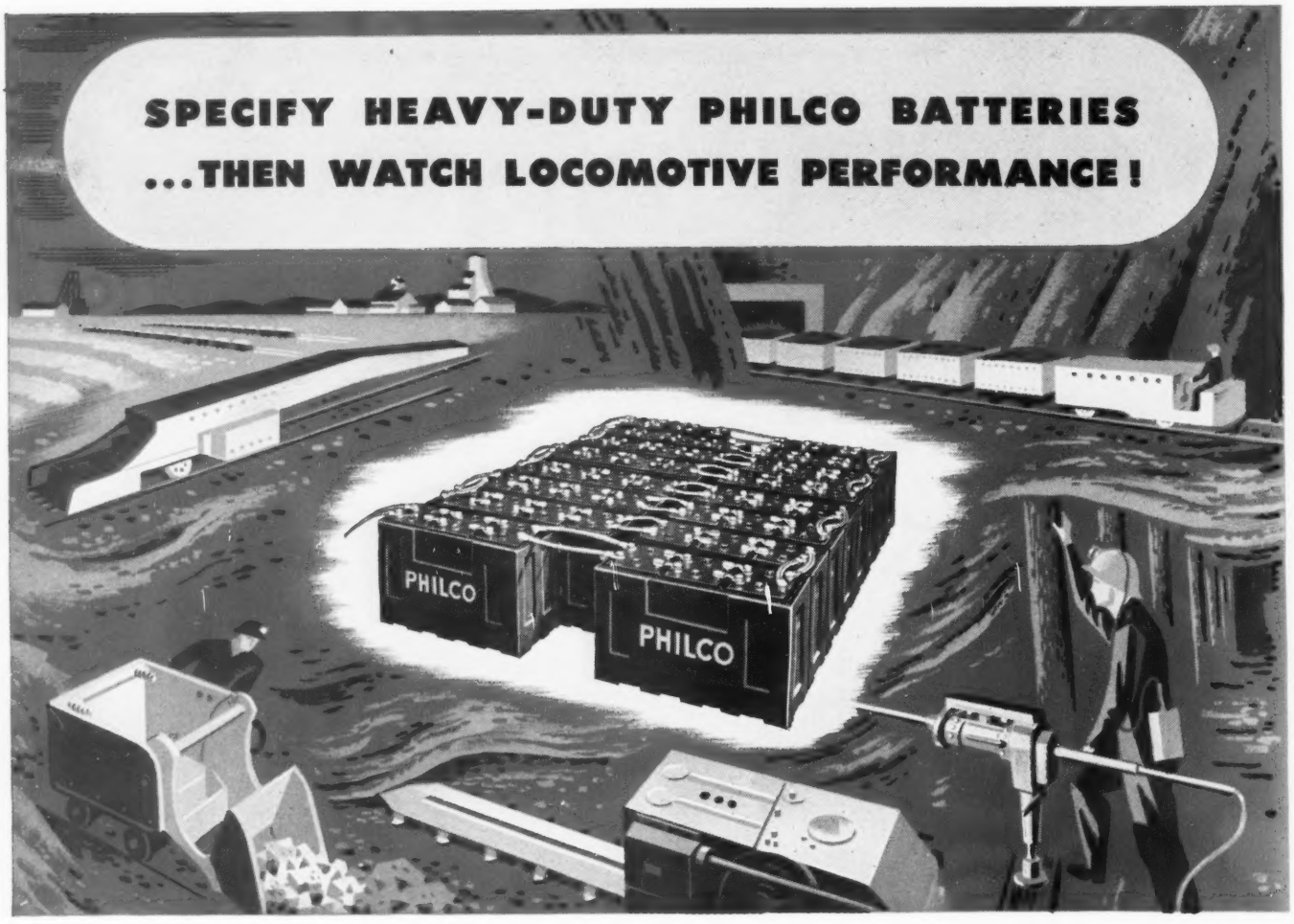

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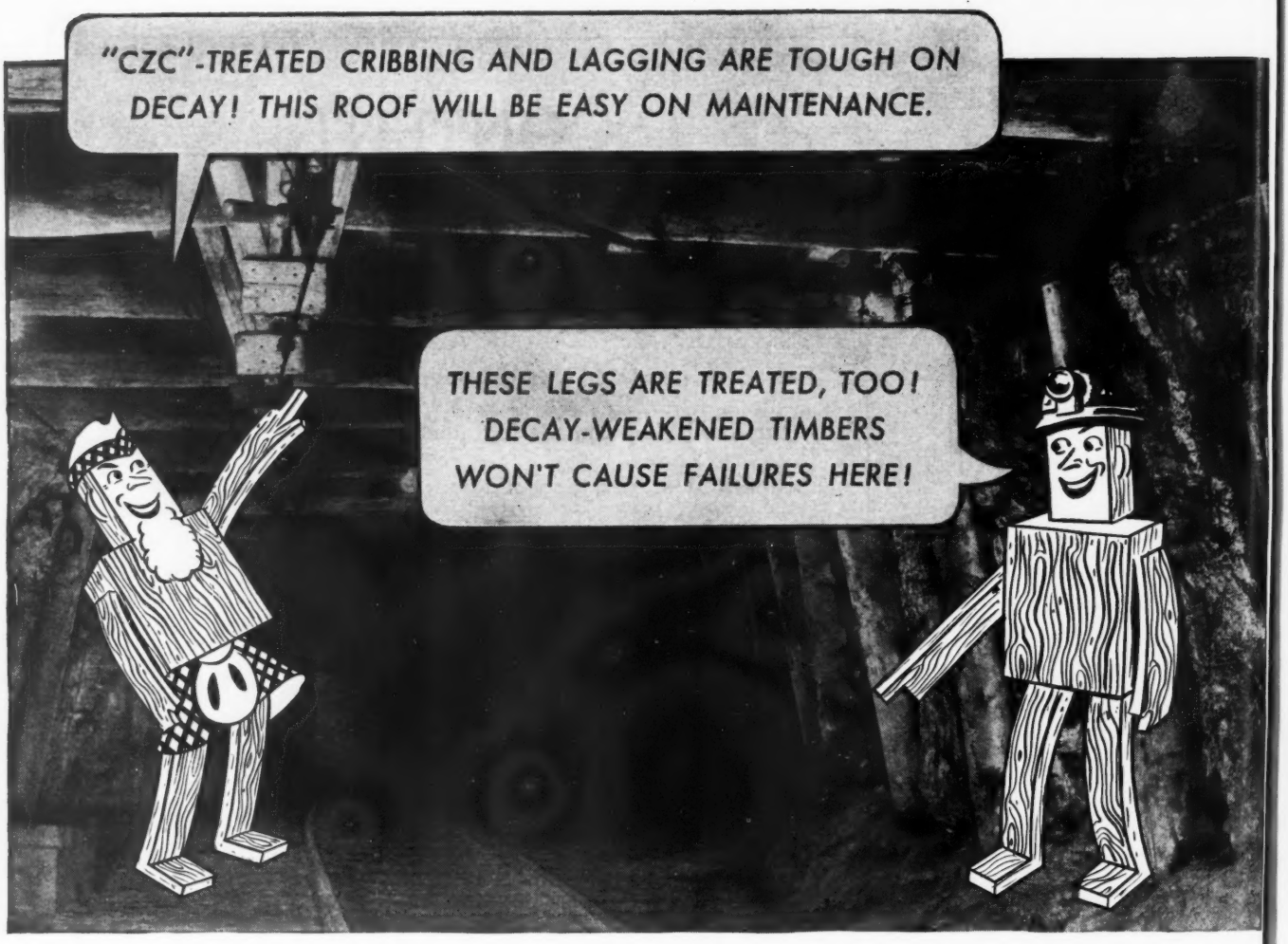
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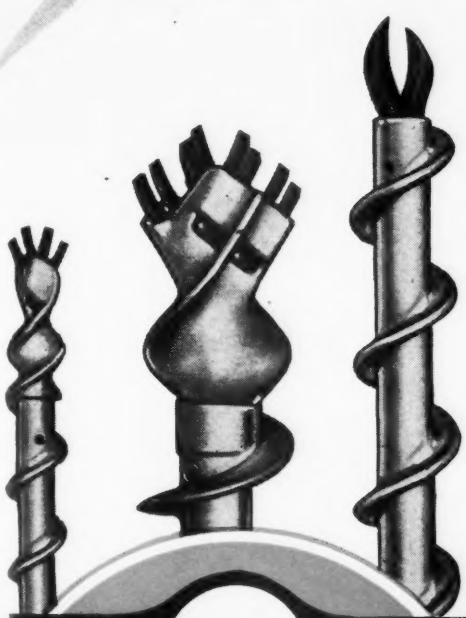

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BLAST HOLE DRILLING Tools

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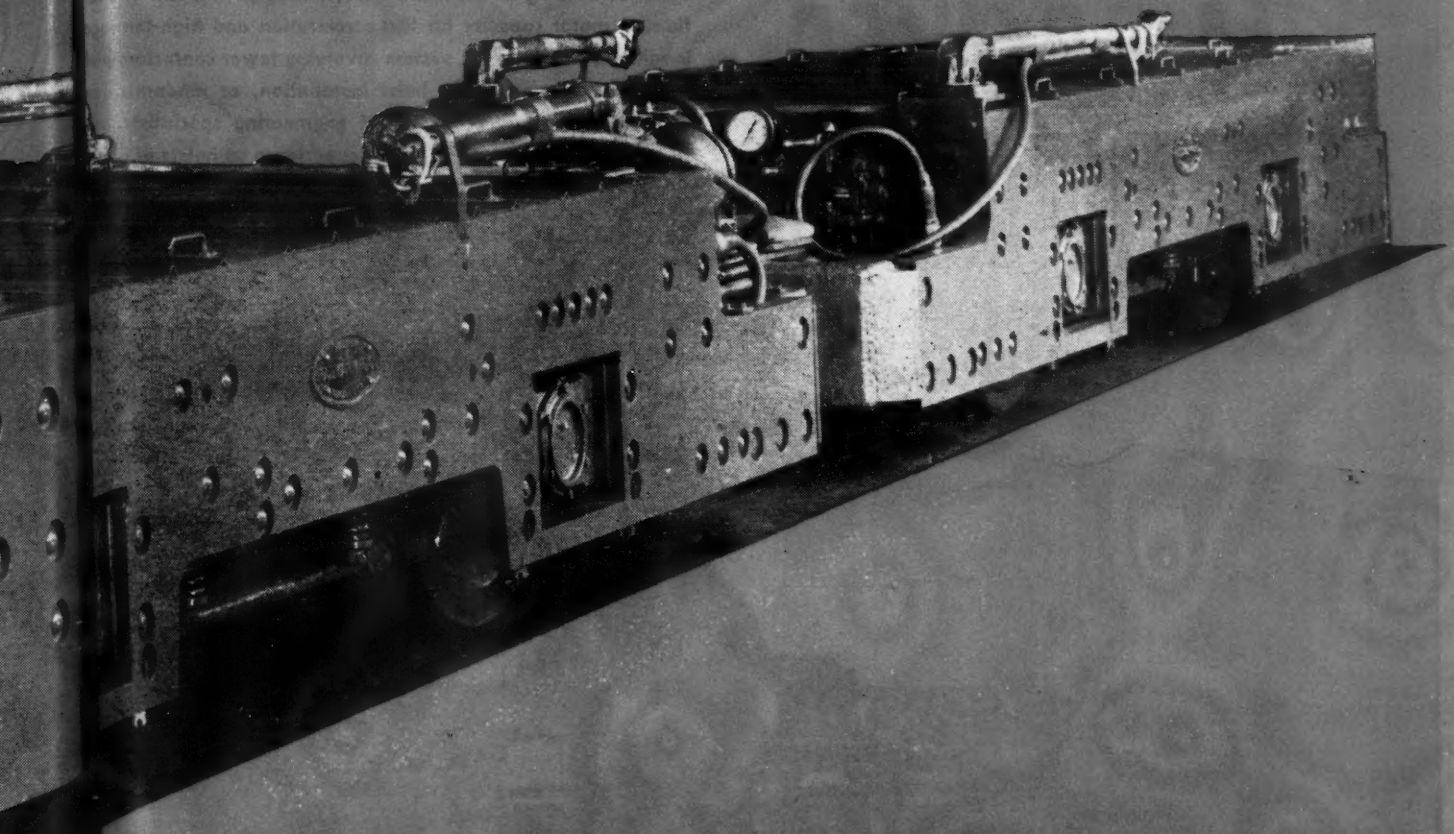

A 26-ton tandem unit with a total motor capacity easily capable of handling heavy loads on long hauls. Distinct operating advantages of this powerful unit:

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- roller type journal bearings
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- transverse equalizers
- externally ventilated motors
- may be arranged for separate or permanent tandem operation

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WANT HIGH-TONNAGE HOISTS

Choose one of these

IMPROVED G-E DRIVES

New engineering advances in G-E drives mean extra tonnage from mine hoists. These advances include amplidyne control of generator voltage actuating d-c hoist motors, and improved dynamic braking of a-c hoist motors. They permit full utilization of motor capacity for fast acceleration and high-tonnage loading, with a control system involving fewer contactors and relays. Before you plan a hoist installation, or modernize an old one, call for the aid of G-E engineering specialists and take advantage of their practical experience on hoists of every type, speed range, and capacity.

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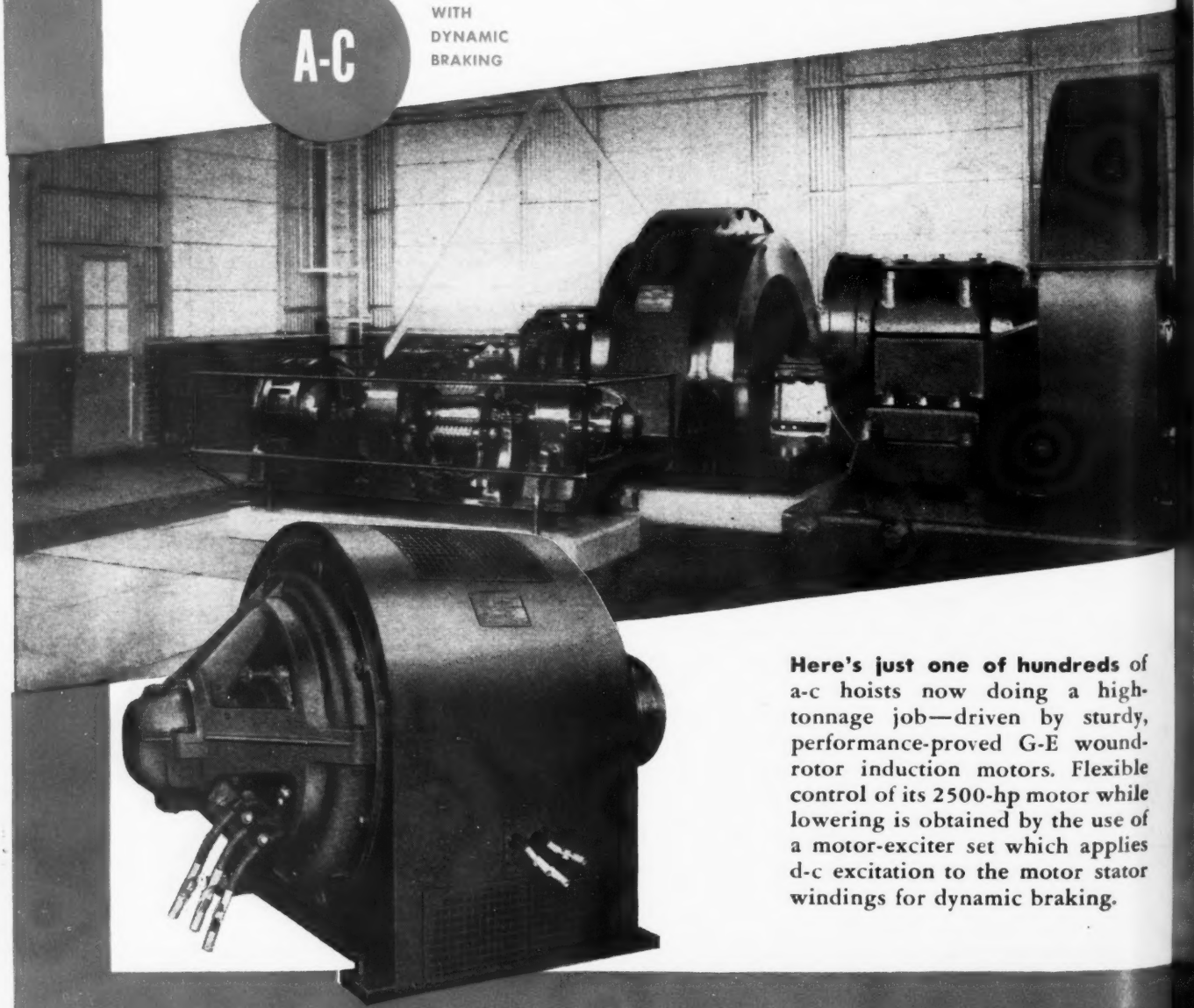
A-C WITH DYNAMIC BRAKING

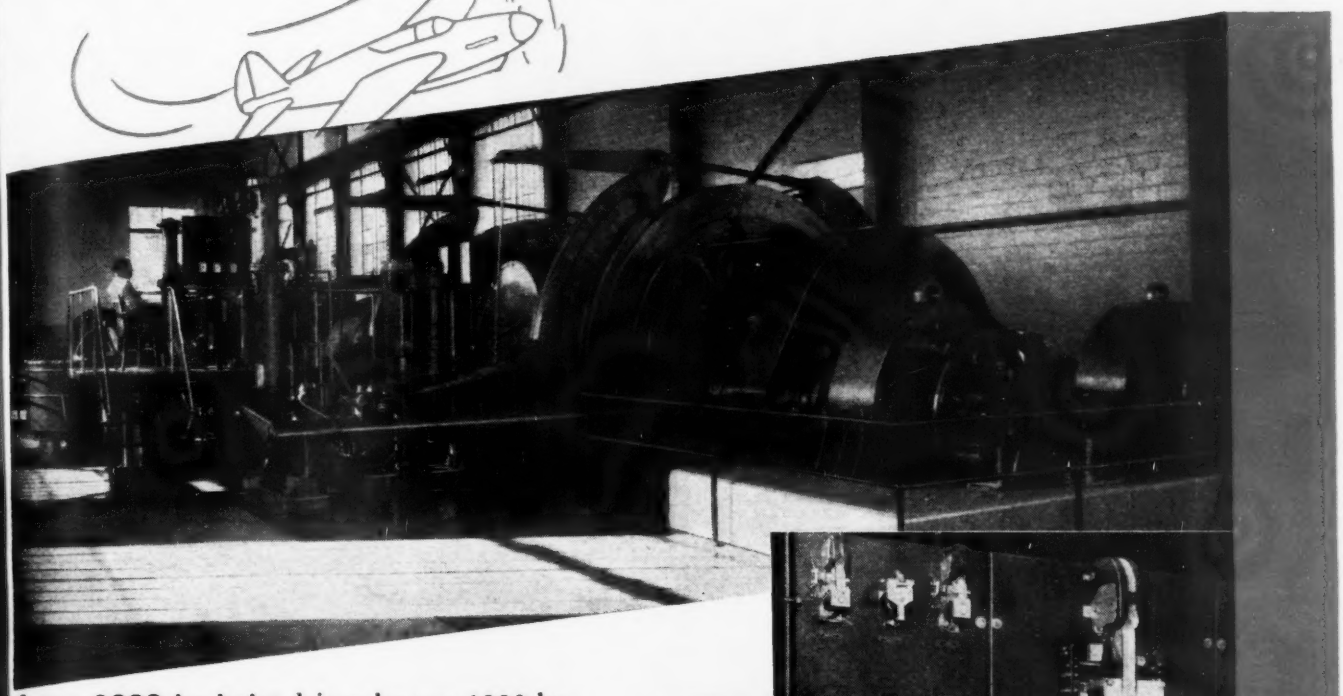


Here's just one of hundreds of a-c hoists now doing a high-tonnage job—driven by sturdy, performance-proved G-E wound-rotor induction motors. Flexible control of its 2500-hp motor while lowering is obtained by the use of a motor-exciter set which applies d-c excitation to the motor stator windings for dynamic braking.

Typical 1000-hp, 2200-volt, wound-rotor induction motor for mine-hoist drive

Every week 192,000 G-E employees purchase more than a million dollars' worth of War Bonds.

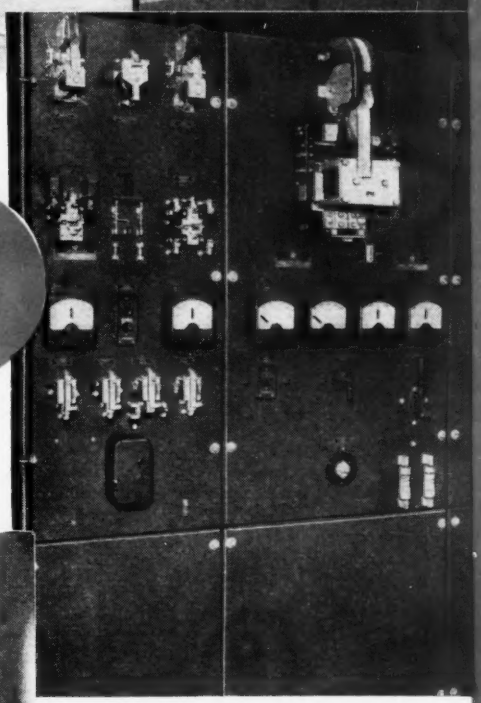
...with PURSUIT-SHIP RESPONSE?

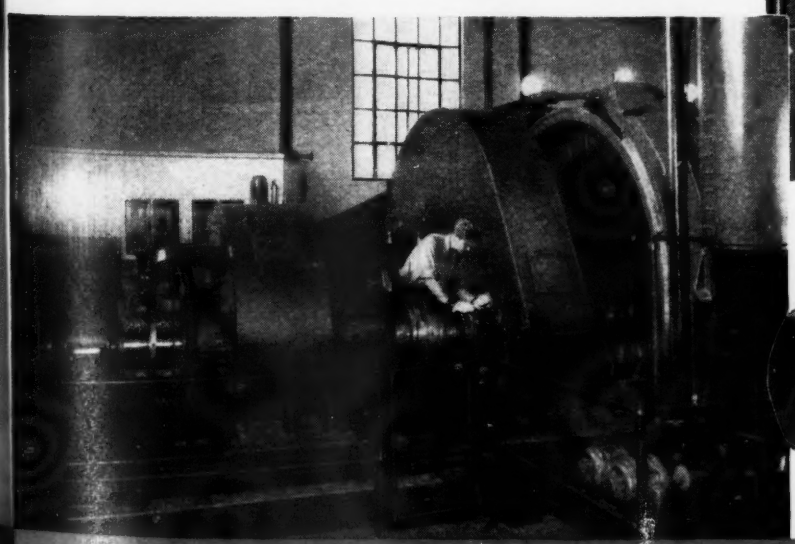


A new 2000-hp hoist driven by two 1000-hp, geared, d-c motors which will raise 38,000 pounds of ore at the rate of 2000 feet per minute. The motor-generator set supplying power to these motors is controlled by a G-E amplidyne, giving "pursuit-ship" acceleration response without a complex contactor setup. (Below) Hoist directly driven by a G-E motor which was recently modernized to increase capacity by the use of amplidyne control.

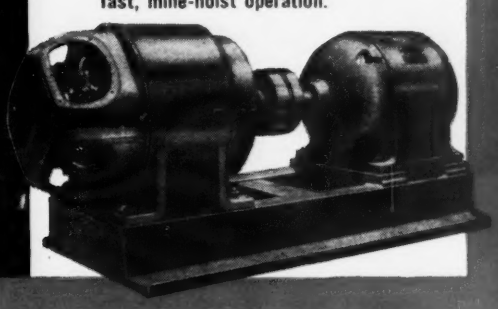
D-C

WITH AMPLIDYNE CONTROL





Simple control panel used with G-E amplidyne (below) for smooth, fast, mine-hoist operation.



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One of the ways to accomplish this is through really *effective* lubrication . . . TEXACO Lubrication.

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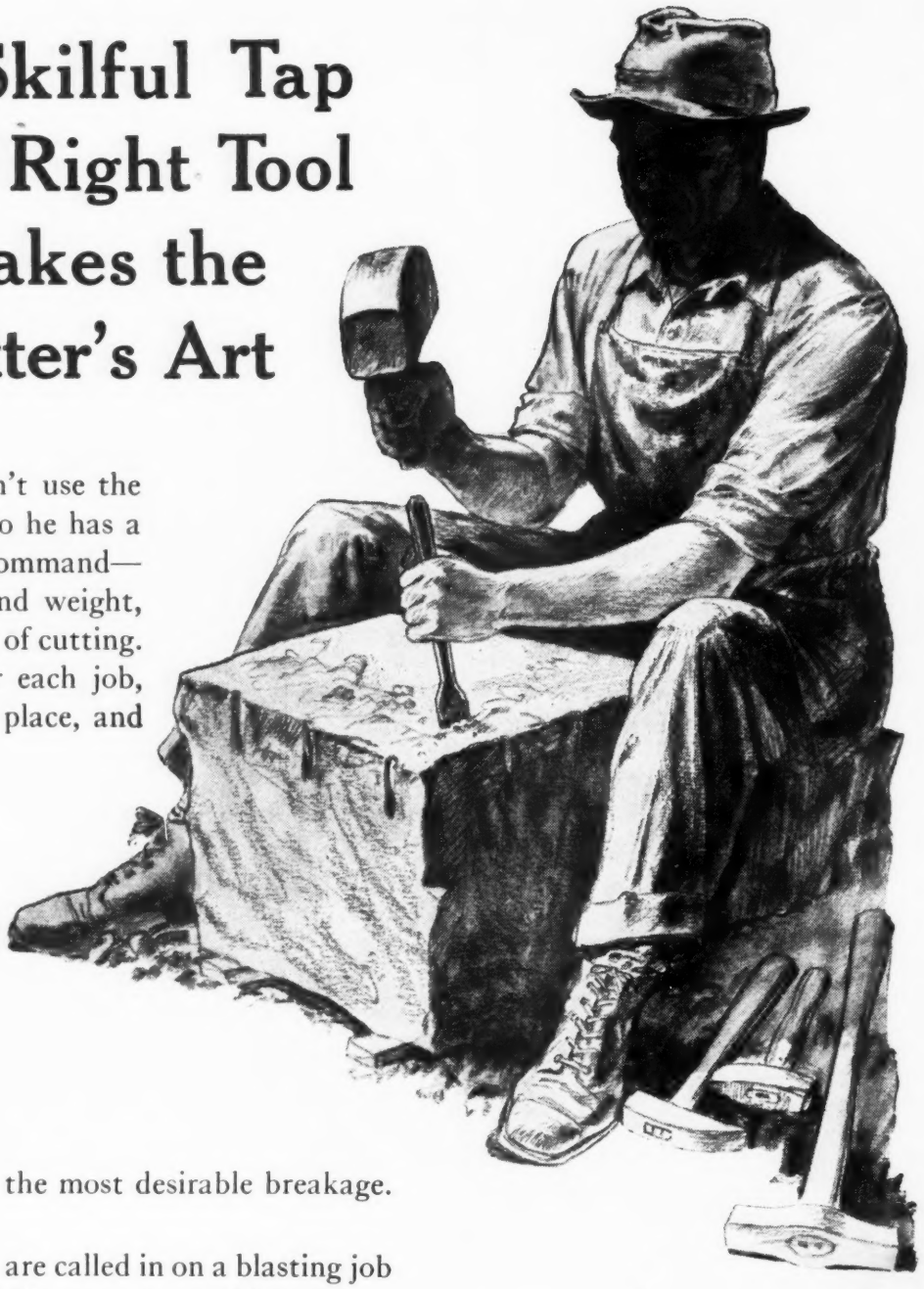
Texaco Lubrication Engineering Service is available to you through more than 2300 Texaco distributing points in the 48 States. The Texas Company, *National Sales Division, Dept. C.*, 135 East 42nd Street, New York 17, N. Y.

C LUBRICANTS for the Coal Mining Industry

It's the Skilful Tap With the Right Tool That Makes the Stonecutter's Art



THE stonecutter doesn't use the same hammer on all jobs. So he has a number of hammers at his command—each of a different shape and weight, each made for a specific type of cutting. Using the *right* hammer for each job, hitting in exactly the right place, and with just the right force, the stone is cut precisely as the stonecutter wants it.

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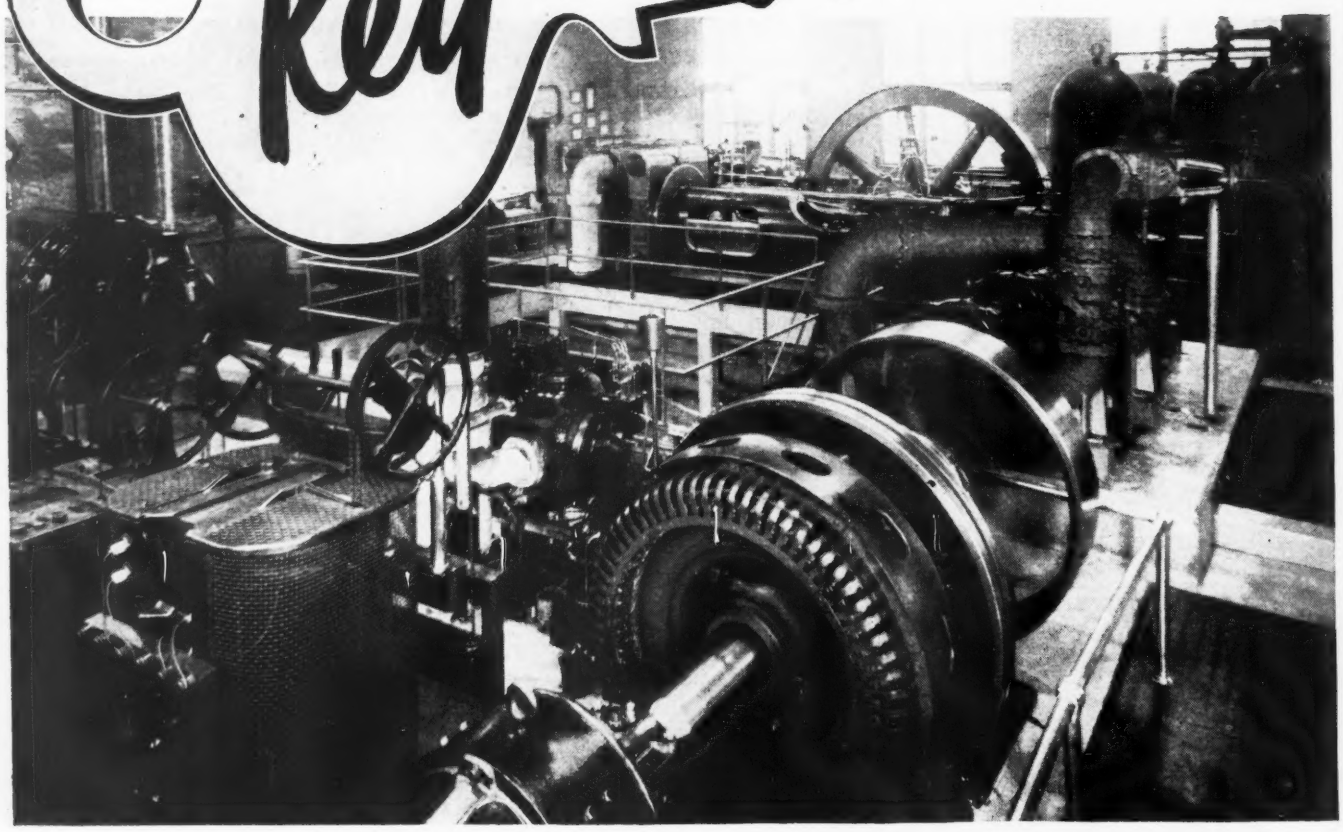
A Key to BETTER MAINTENANCE



Continuous operation, excessive wear, and today's replacement difficulties demand *better maintenance* of power units.

A key to better maintenance is *better lubrication.*

Sinclair Steam Cylinder and Valve Oils are specially designed for better lubrication of *STEAM ENGINES.* These oils meet wide fluctuations of temperature and moisture conditions . . . give immediate emulsification . . . assure adhesion of lubricating film to valves and cylinder walls.

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Where overtime heavy duty operation threatens severe wear and overhaul shutdowns, Sinclair lubricants make for *better maintenance.* Consult us about your lubrication problems.

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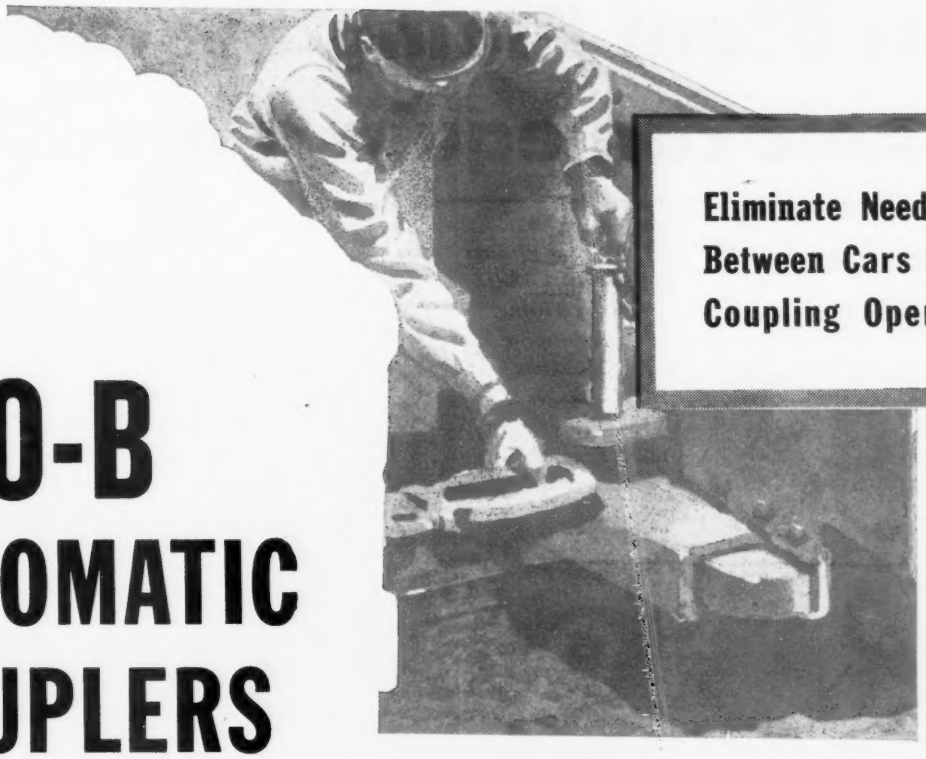

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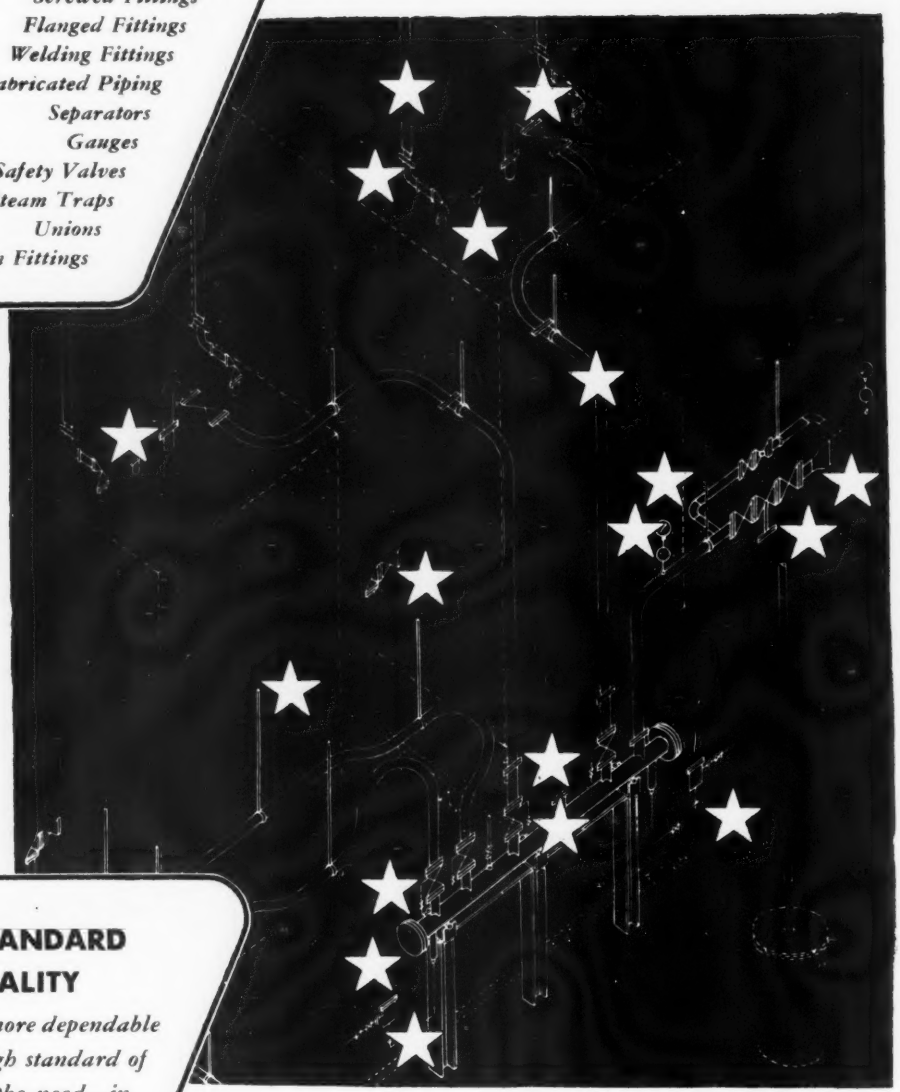

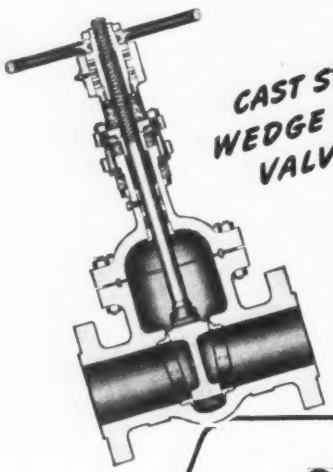

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Steam Piping for Two-Boiler Hook-up

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The whole system is more dependable because there's one high standard of quality—adequate for the need—in every part. In Crane Steel Gate Valves, for example: Straight-through ports minimize turbulence, erosion, resistance to flow. Strong tee-head disc-stem connection, ball-bearing yoke, and non-corrosive stem bearings assure smoothest operation. Adequate stem power and extra long disc guides make seating positive.

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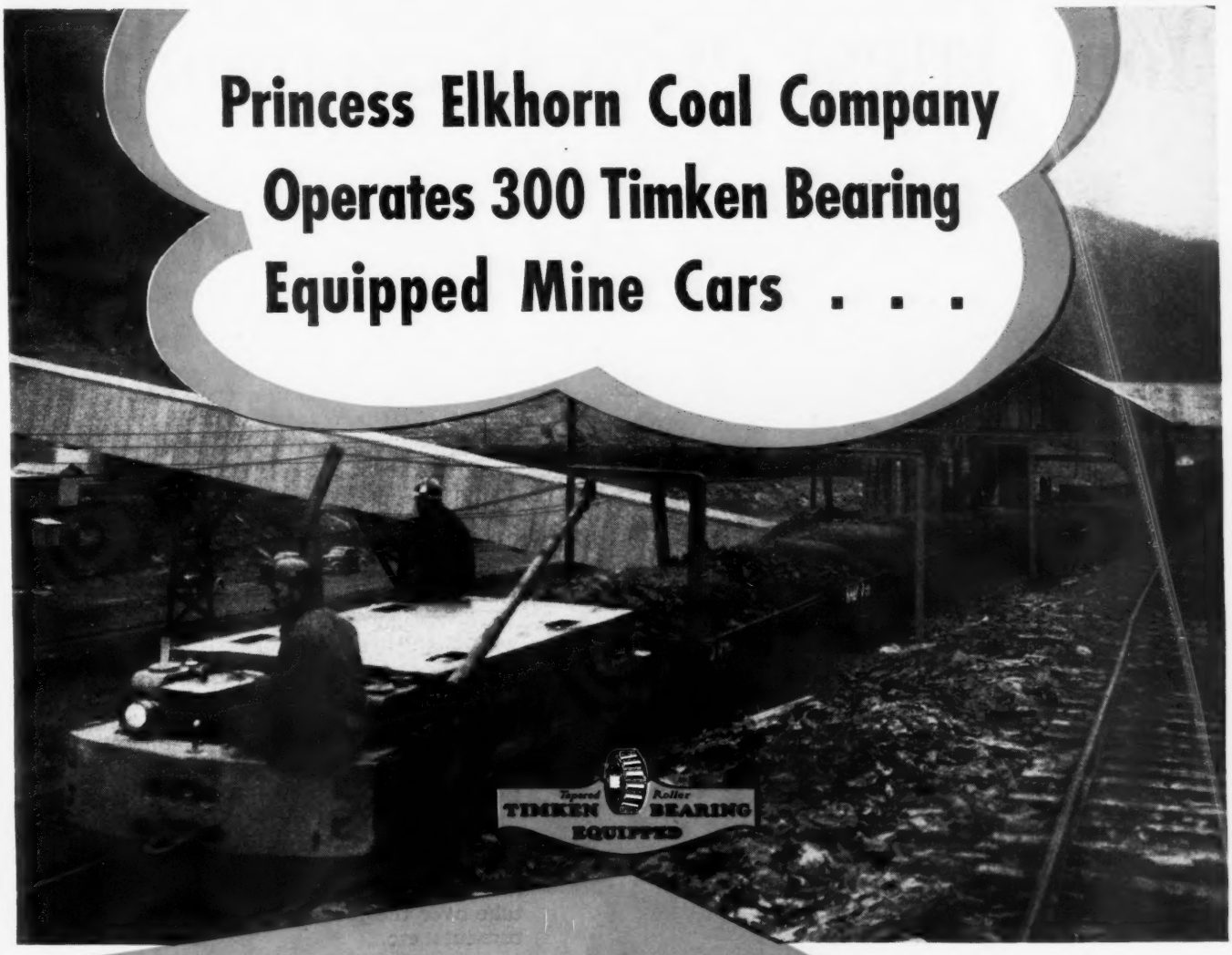
Princess Elkhorn Coal Company Operates 300 Timken Bearing Equipped Mine Cars . . .



This photograph was taken at the No. 1 Mine of the Princess Elkhorn Coal Company, David, Kentucky. It shows some of the 300 Enterprise mine cars equipped with Timken Bearings in service there.

These modern cars are of the stub axle type and carry approximately 3 tons of coal each. They were placed in service about 2 years ago and have given great satisfaction ever since.

The Princess Elkhorn No. 1 Mine produces 2,000 tons of coal per day. Another mine, designated No. 2, for which 100 new Timken Bearing Equipped cars have been ordered, has recently been opened in the same locality.

Thus, another satisfied user is added to the list of more than 1,000 mine operators who have proved it pays —over and over—to operate mine cars equipped with Timken Tapered Roller Bearings. The Timken Roller Bearing Company, Canton 6, Ohio.

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Your latest critical commodity

MAN-HOURS

Almost everywhere, in every field of industry, "Help Wanted" has become a familiar appeal.

To meet wartime needs will call for the mining of 660,000,000 net tons of coal in 1944—a considerable increase over 1943. The mines are faced with the problem of getting out this tonnage with 60,000 fewer men.

Those figures are one of the reasons why Bethlehem's Preformed Track has such a definite spot in the plans of mining engineers. For "preformed" means exactly what it says—means that the track has been figured, cut, bent, and fabricated in Bethlehem's own shops, and reaches the mine ready to assemble. What does this add up to?

First, it saves you considerable paper work. After Bethlehem engineers have received the details of your layout, they take over the job of calculating curves, turnouts, etc.

Second, it eliminates the hard labor involved in trying to form the track satisfactorily on your own property with your own equipment.

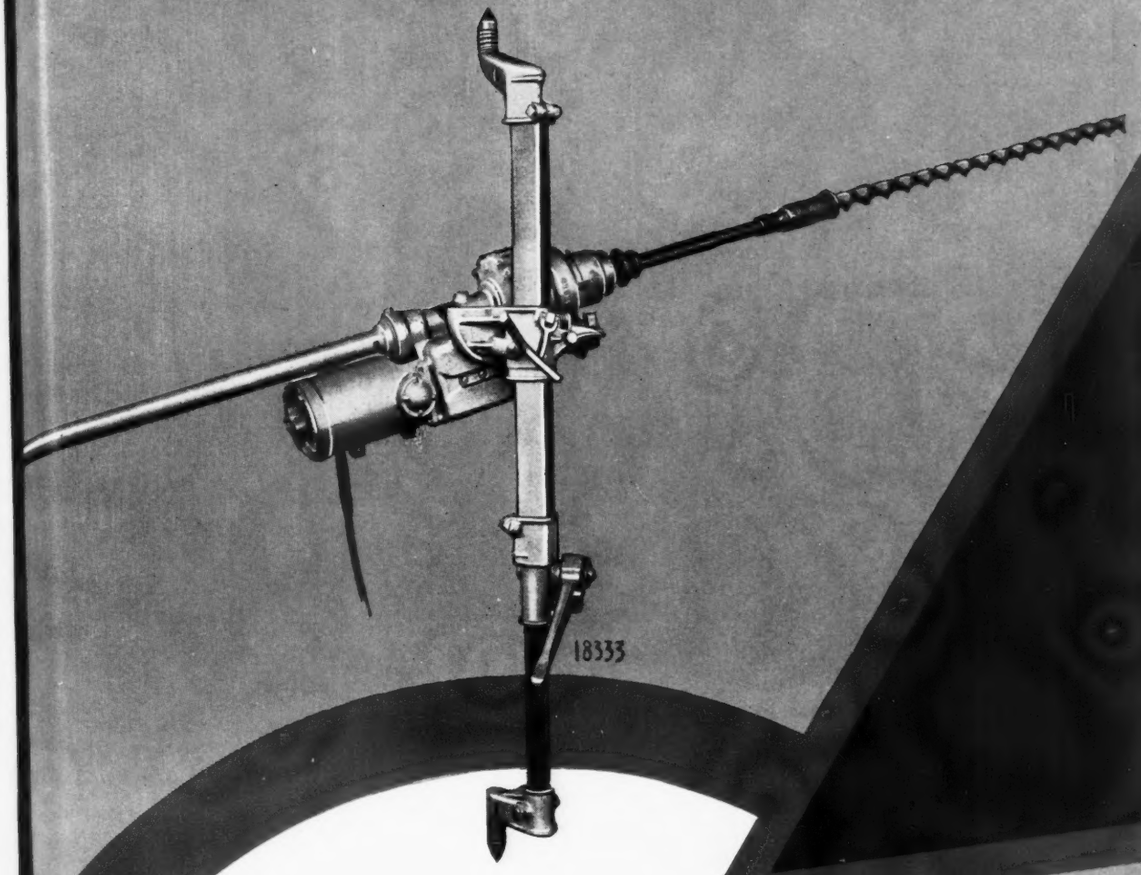
Third, it speeds up track-laying to such an extent that you can release men for other, more productive work in the mine.

And this last is the biggest point of all, right now—the *saving of time and manpower*. Case histories have proved that Bethlehem preformed turnouts, for example, can be laid and recovered in about half the time required for ordinary types.

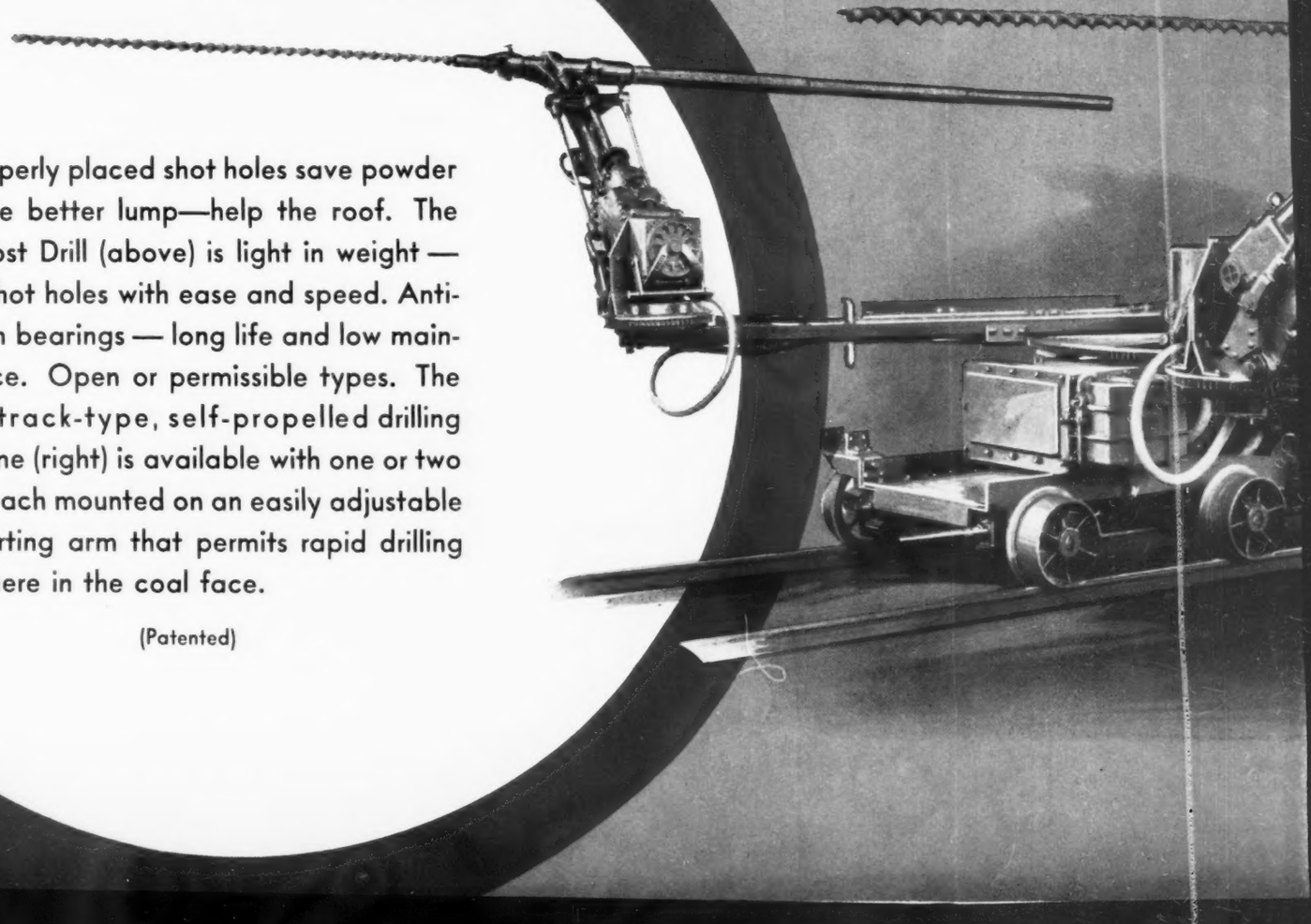
If you haven't yet used any preformed track, a Bethlehem engineer will gladly give you facts and figures.

PREFORMED TRACKWORK

★ ★ ★ BETHLEHEM STEEL ★ ★ ★



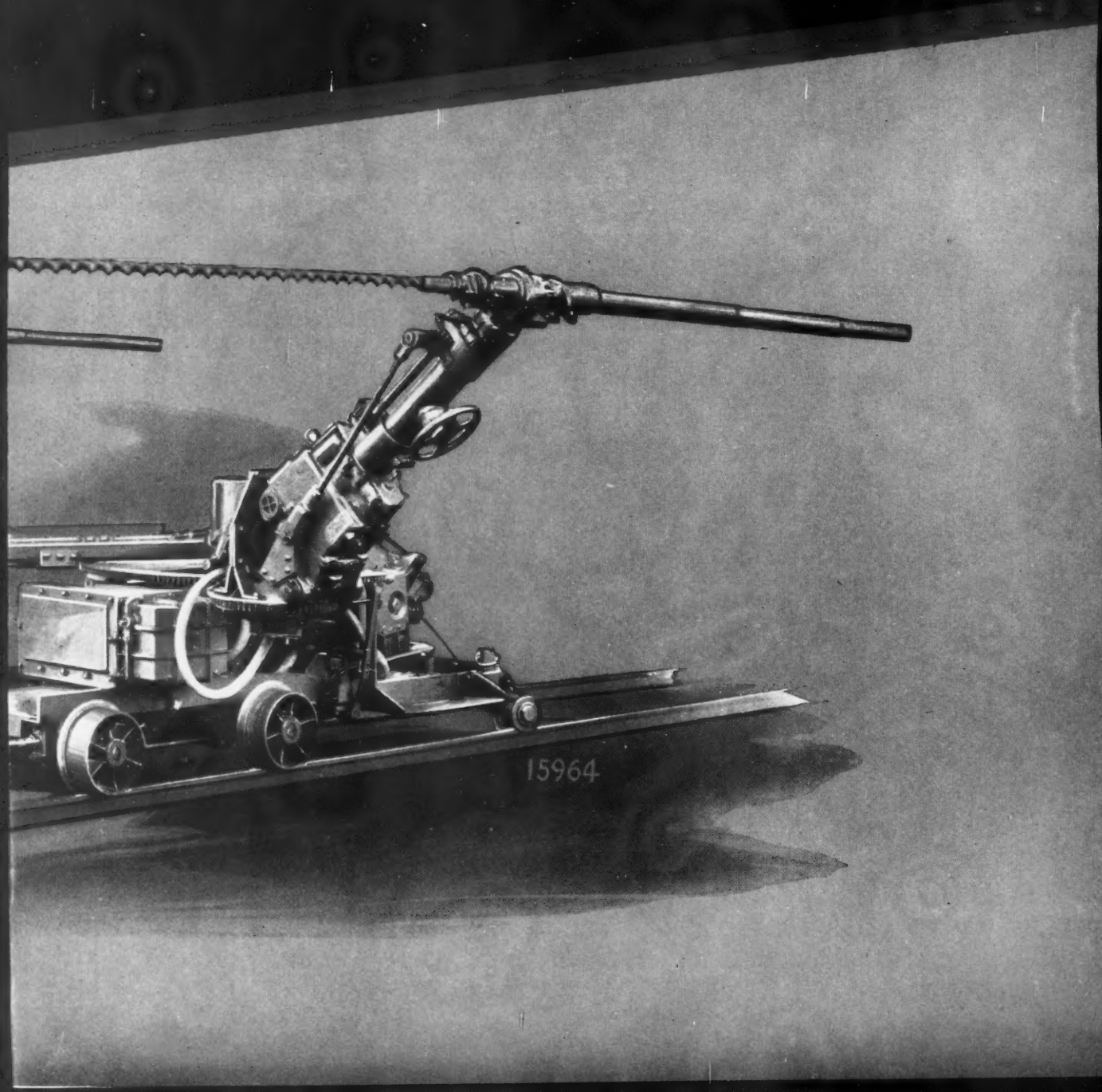
Jet

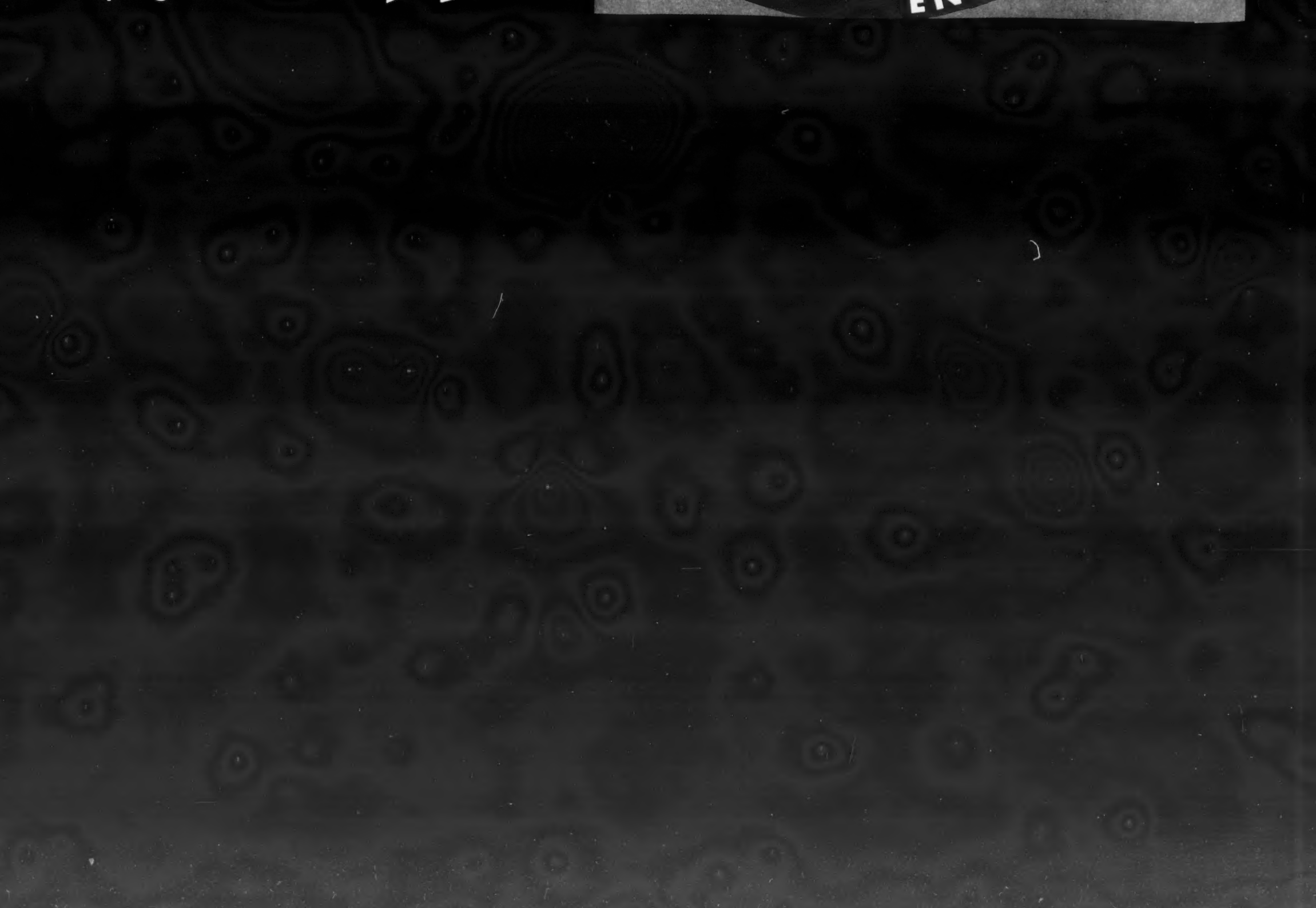


● Properly placed shot holes save powder —make better lump—help the roof. The A-6 Post Drill (above) is light in weight — drills shot holes with ease and speed. Anti-friction bearings — long life and low maintenance. Open or permissible types. The 56-A track-type, self-propelled drilling machine (right) is available with one or two drills each mounted on an easily adjustable supporting arm that permits rapid drilling anywhere in the coal face.

(Patented)

Jeffrey DRILLING EQUIPMENT





589,000,000
tons of bituminous
coal mined in 1943

It all had to be drilled

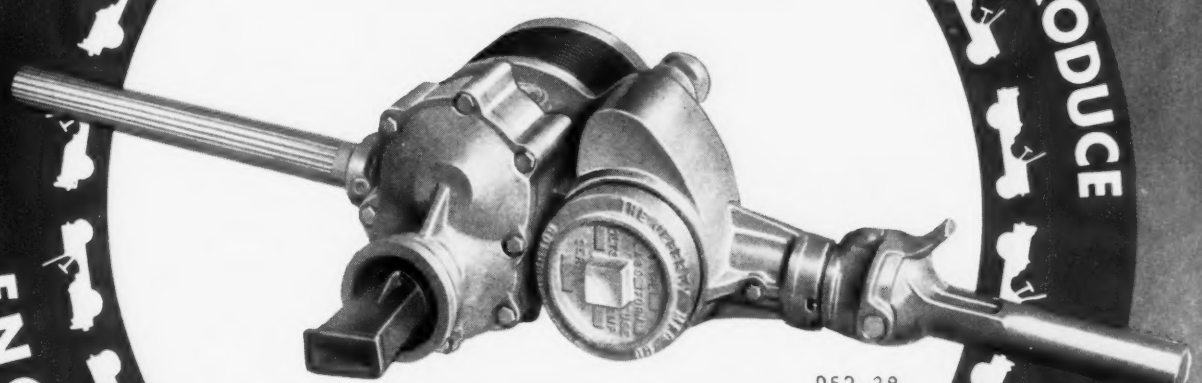
You can drill it better
with Jeffrey Drills

JEFFREY BUILDS DRILLS

FOR EVERY DRILLING REQUIREMENT • • • • HAND AND POST DRILLS AND DRILLING MACHINES

IT REQUIRES 187½ TONS OF COAL TO PRODUCE ENOUGH STEEL TO BUILD 100 JEEPS

This Jeffrey A-7 Hand Held Drill is always ready for service. No time is lost in setting up or transporting from place to place. Totally enclosed construction—anti-friction



952-38

bearings—safety clutch available for protection of operator. Specially designed quick break trigger-operated switch. Open or permissible types.

(Patented)

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WAR BONDS

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POST DRILLS
G MACHINES

BUY
WAR BONDS

Jeffrey

SERVES THE INDUSTRY
BELOW AND ABOVE GROUND
FROM FACE TO RAILROAD CAR

CUTTERS
DRILLS
LOADERS
LOCOMOTIVES
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CONVEYORS
BLOWERS
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THE JEFFREY MANUFACTURING COMPANY

Established in 1877

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Sales Offices:	Baltimore Birmingham Boston Buffalo	Chicago Cleveland Cincinnati Detroit	Denver Harlan Houston Huntington	Milwaukee New York Philadelphia Pittsburgh	Scranton St. Louis Salt Lake Ci
Service Stations:	Pittsburgh Harlan, Ky.	Birmingham St. Louis	Logan-Beckley W. Va.		Scranto
Foreign Plants:	Jeffrey Mfg. Co., Ltd. Montreal, Quebec	British Jeffrey-Diamond, Ltd. Wakefield, England		Jeffrey-Galion (Pty.), Lt Johannesburg, S. A.	

Handling any number of jobs in connection with mining work, the 2-cycle Diesel tractor is always "on the go." Here it grades a site for new buildings.

The tractor has proved a salvation to miners in many ways . . . especially during these times of manpower shortage.

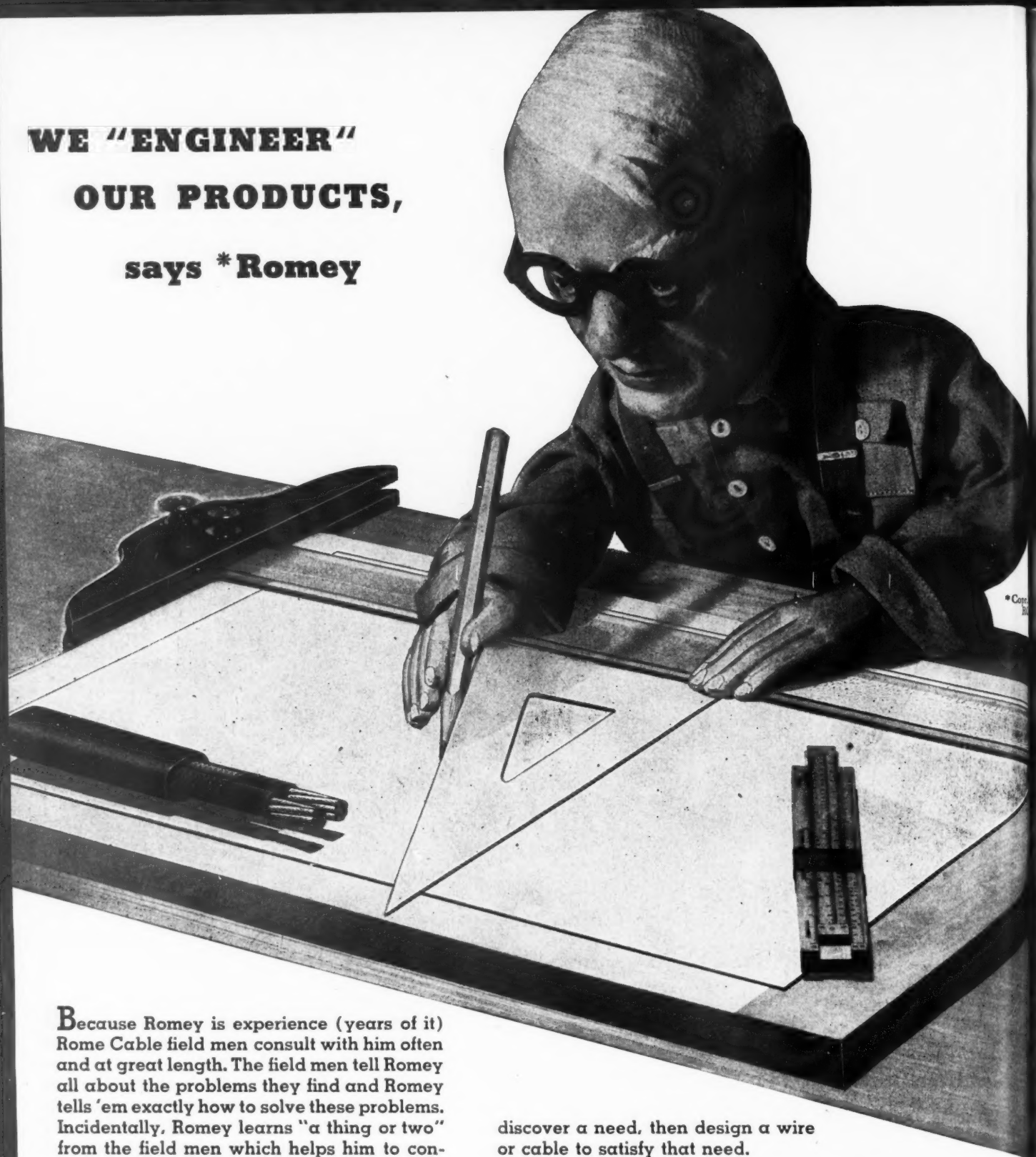
That new road you need for bringing in supplies is cut through quickly with powerful, fast-working 2-cycle Diesels. Stripping or cleaning-up work is now handled at the fastest pace in history . . . and at correspondingly lower costs. Especially ideal is the ease with which you clear trees, stumps and debris . . . or move your machinery from place to place.

Tractors are sorely needed on the fighting fronts and for constructing outlying bases. But they are needed in essential industry, too! That's why the government allows 15% of our crawler tractor production for home front use. Consult your Allis-Chalmers dealer about the availability of equipment.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

2-Cycle THE MODERN DIESEL POWER

WE "ENGINEER" OUR PRODUCTS, says *Romey



Because Romey is experience (years of it) Rome Cable field men consult with him often and at great length. The field men tell Romey all about the problems they find and Romey tells 'em exactly how to solve these problems. Incidentally, Romey learns "a thing or two" from the field men which helps him to constantly improve production practices.

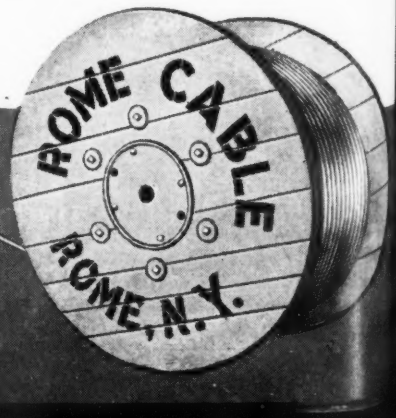
"Although we are very busy engineering and producing new war products, we always do our best to serve you," says Romey. "We discover a need, then design a wire or cable to satisfy that need.

"Right now we're awfully busy taking care of you as Uncle Sam directs but we're looking forward to the day when we can send you all the Rome Cable products you need."

FROM BAR TO FINISHED WIRE

ROME CABLE CORPORATION

ROME • NEW YORK



Relieve Your Manpower Problem!

*HAULPOWER: Fully delivered tractive power, not merely engine horsepower. Walter Four Point Positive Drive provides maximum use of FOUR driving wheels in soft dirt, over slippery surfaces, up steep grades. Three Automatic Locking Differentials proportion power to wheels according to the traction of each wheel at any instant, preventing slippage.

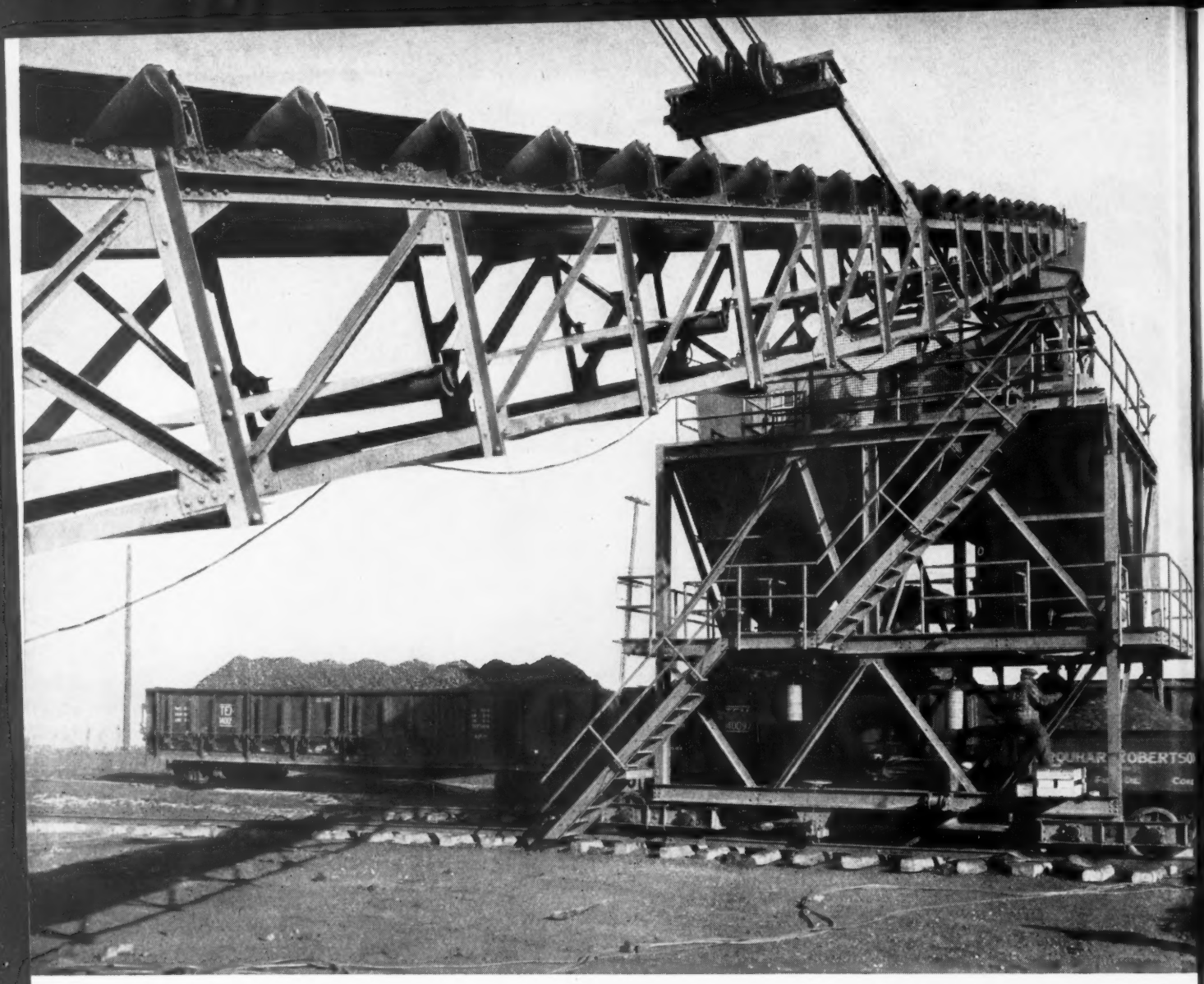
Increase your "HAULPOWER"* to keep up your TONNAGE!

Hauling with Walter Tractor Trucks offers you a practical starting point to recover lost tonnage due to manpower shortages. These huge haulers pull enormous payloads (according to any trailer capacity you choose) at unequalled speeds. Fewer units are needed because greater tonnage is delivered per driver, per trip.

Walter Tractor Trucks' higher tonnage capacity is the integrated combination of many engineering advances, chief of which is the exclusive Walter Four Point Positive Drive which provides tremendous "Haulpower"*. Greater gear capacity is provided by the Walter Tractor Type Transmission and Suspended Double Reduction Drive. Easy maneuverability is furnished by short wheelbase and scientifically distributed weight. Write today for the complete details.

WALTER MOTOR TRUCK COMPANY
1001-19 IRVING AVE., RIDGEWOOD 27, QUEENS, L. I., N. Y.

WALTER
TRACTOR TRUCKS



Here's a typical example of S-A engineering—a traveling coal preparation unit with belt conveyo vibrating screens, delivering sized coal to trucks a

From Mine to Car at Lowest Handling Cost . . .

RESULT OF S-A *Engineering*

Stephens-Adamson has, for over 42 years, been planning and building successful coal handling and processing systems for all phases of mining operations. Correctly engineered arrangements are put into operation by conveying, elevating, screening and crushing equipment manufactured by S-A. . . A complete line of manufactured material handling machinery units, plus the "know how" of arranging this equipment into efficient and economical systems, qualifies S-A for the important job of planning and equipping your mine's handling system.

STEPHEN S-A ADAMSON MFG. CO.

2 RIDGEWAY AVENUE, AURORA, ILLINOIS — LOS ANGELES, CALIF. ★ BELLEVILLE, ONT.

Designers and Manufacturers of All Types of

BULK MATERIAL HANDLING EQUIPMENT

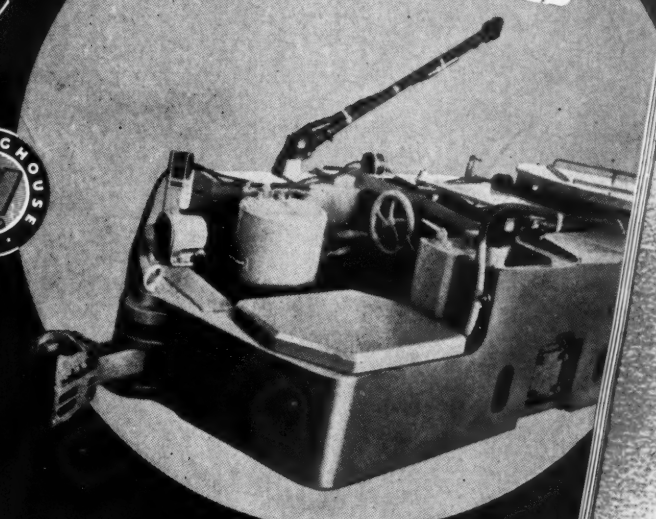
All the facts from trolley to rail

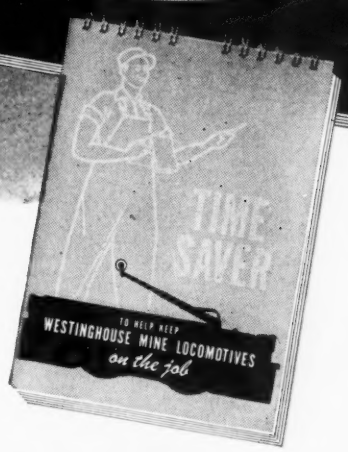
. . . SEND FOR THIS BOOKLET TODAY!

WESTINGHOUSE

Explosion Tested

LOCOMOTIVES





Safety and economy on the job **are realized with Westinghouse Explosion-Tested Mine Locomotives . . . especially equipped for safe operation in gaseous mines. This modern locomotive design overcomes disintegration of insulation and corrosive destruction of internal parts, thanks to an exclusive Westinghouse development . . . the BREATHER principle of ventilation which creates a free and forced circulation of air within the equipment . . . thus eliminating the formation of destructive acids.**

Other Westinghouse developments are the vertical gearless gathering reel with easily accessible slip rings and brushholders to save inspection time, and the self-equalizing ribbon-wound resistor which minimizes overloading of individual sections. These and other features in Westinghouse Explosion-Tested Locomotives give you 24-hour war operation with minimum time out for maintenance.

For complete information, ask for Booklet B-3232. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TO KEEP YOUR LOCOMOTIVES *on the job!*

Send for this pocket-size 40-page "TIME-SAVER". It is crammed with useful information which will save you time in inspection, lubrication and maintenance. Ask for B-3150.

J-90498

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

MINE LOCOMOTIVES

Fastest, Lightest Post-Mounted Coal Drill

40 to 60 HOLES PER SHIFT

CP No. 574 Permissible Electric Coal Drill—fastest and lightest mounted electric coal drill and one of four CP post-mounted models—has a speed of 40" per minute, 40 to 60 holes per shift. Safe powerful motors, approved by the U. S. Bureau of Mines, run at unusually low temperatures and have large momentary overload capacity. Ball bearings, heat treated gears, fine material and workmanship assure long life and low maintenance. Write for Catalog 901, Second Edition, illustrating various combinations of motor hookups, clutches, posts, boots, boxings, etc. Select the drill assembly best suited to your requirements.

Why CP Post-Mounted Electric Coal Drills Cut Drilling Costs

Quicker Set-up of Post • Faster Drilling Speed Parallel Drilling Within 2 Inches of Roof or Bottom • Accident-Proof Auger Socket • Accident-Proof Boxing and Liner • Adjustable Feed Clutch — hand controlled

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PNEUMATIC TOOLS
ELECTRIC TOOLS
(Hicycle...Universal)
ROCK DRILLS

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

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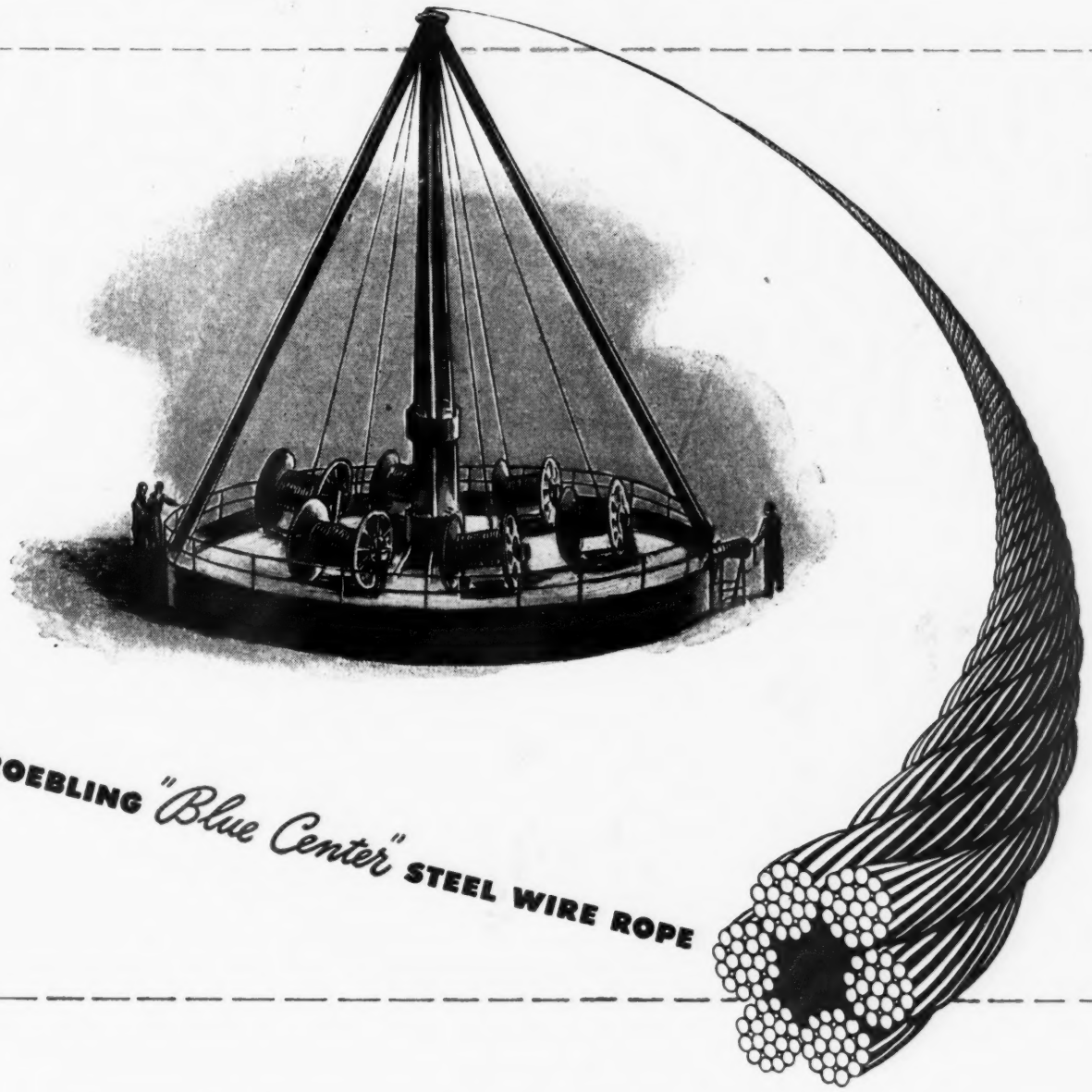
AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES

Rope making, stranding, closing equipment fitted to the job. If you need a 5" diameter rope this giant is ready to close a single 80 ton length of it



ROEBLING *"Blue Center"* STEEL WIRE ROPE

WHAT CAN YOU EXPECT from Roebling? Rope that has known capacity to deliver service. Engineering, in our plant and at your job, to put the rope to work right. Maintenance practices that protect its long life. » » Your postwar profits and postwar jobs will depend in part on operating rope-rigged equipment at lowest cost. You can leave that part to Roebling.

JOHN A. ROEBLING'S SONS COMPANY, Trenton 2, New Jersey
Branches and Warehouses in Principal Cities

ROEBLING

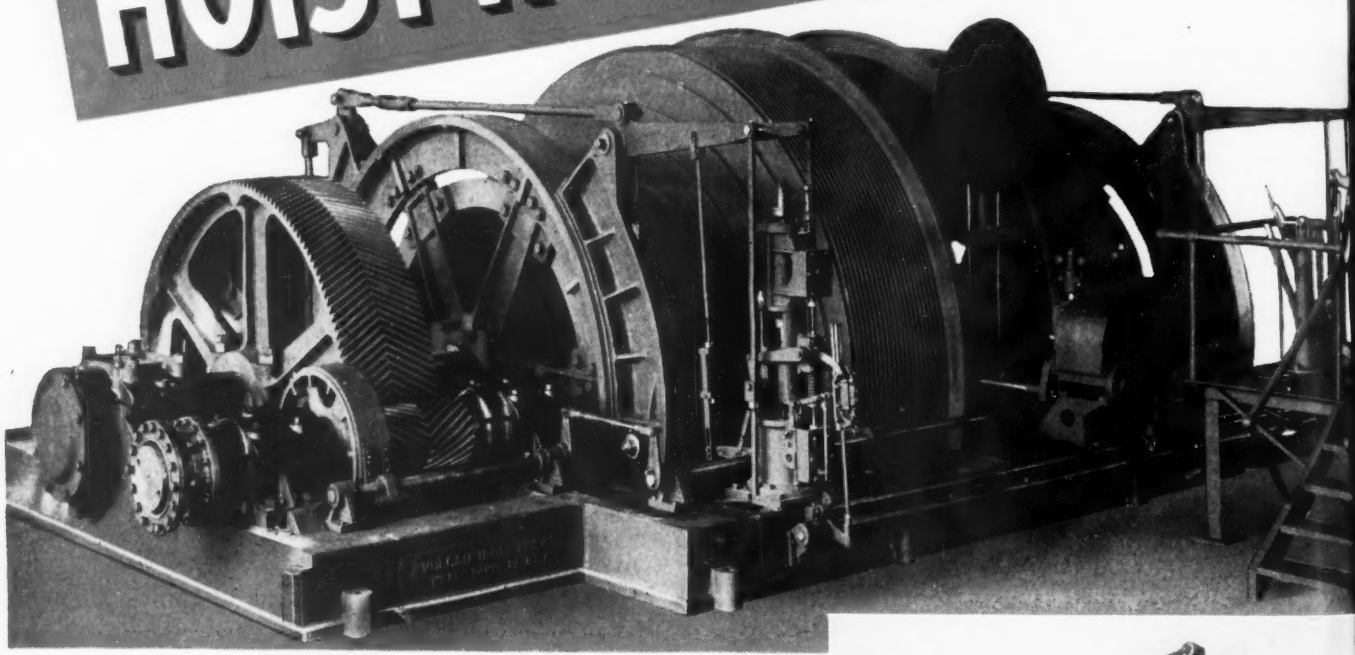
PACEMAKER IN WIRE PRODUCTS

WIRE ROPE AND STRAND • FITTINGS • COLD ROLLED STRIP • SUSPENSION BRIDGES AND CABLES • AIRCORD, SWAGED TERMINALS AND ASSEMBLIES • AERIAL WIRE ROPE SYSTEMS ELECTRICAL WIRES AND CABLES • ROUND AND SHAPED WIRE • HIGH AND LOW CARBON ACID AND BASIC OPEN HEARTH STEELS WIRE CLOTH AND NETTING

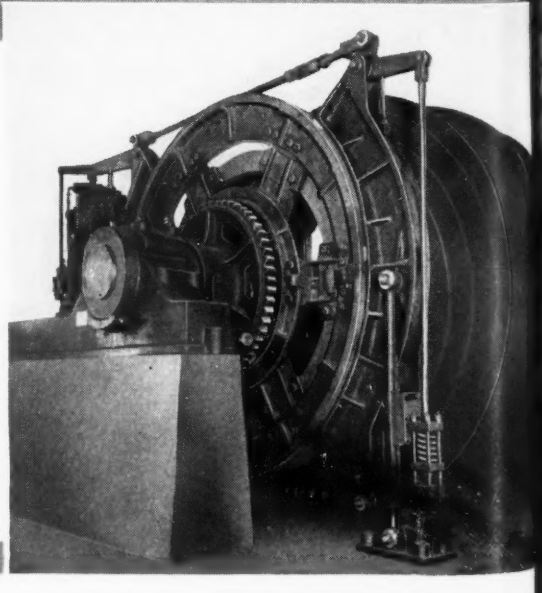
LEHIGH NAVIGATION COAL COMPANY BOOSTS OUTPUT ONE-THIRD IN 1943

Establishing a new anthracite production record, the workers of the Lehigh Navigation Coal Company in the Panther Creek Valley of Pennsylvania, produced one-third more coal in 1943 than in 1942. Total commercial production in 1943 was 4,092,820

NOW.. "Naviqation" takes another step fo rd the MOST POWERFUL HOIST IN THE ANTHRA

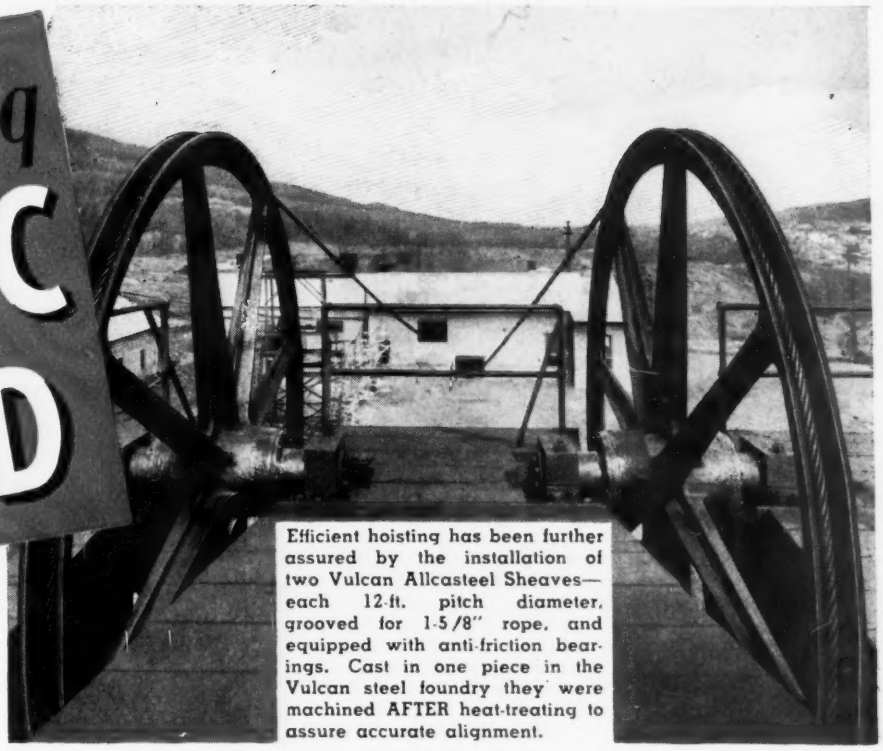


ABOVE: Navigation hoist partially assembled in Vulcan erecting shop before being taken down for shipment. Gear guards not installed. Experienced mining men will recognize the powerful air-operated brake engines and (immediately in front of operator) the Vulcan Safety Devices which provide dependable protection against over-winding, over-speeding, power-failure or mistakes of any kind on the part of the operator. In any of these events the hoist stops—quickly but smoothly—and cannot be started again until normal conditions have been restored.



AT RIGHT: Rear view of hoist showing positive toothed-type clutch with air-operated clutch engine and parallel-motion post-type brake with pressure-graduating rig. The latter is an exclusive Vulcan feature which permits smaller initial clearance between brake-shoe and drum without danger of dragging and assures smoother, more uniform braking action than would otherwise be possible.

...ard by installing ...LECTRIC ...ATE FIELD



Efficient hoisting has been further assured by the installation of two Vulcan Allcasteel Sheaves—each 12-ft. pitch diameter, grooved for 1-5/8" rope, and equipped with anti-friction bearings. Cast in one piece in the Vulcan steel foundry they were machined AFTER heat-treating to assure accurate alignment.

WHEN war-time needs for other fuels increased the demand for anthracite far beyond that of any other ...ecent period the Lehigh Navigation Coal ...ompany was ready—with completed im...rovements, above and below ground, ...hich enabled a loyal working force to ...crease its 1943 output over that of 1942 ...y more than a million tons.

...ow "Navigation" has taken another big ...tep forward by installing the most power...ul electric hoist in the anthracite field, so ...hat even greater production can be se...ured from its famous Coaldale Colliery. ...owered by a 1750 hp. motor, its cylindro...onical tight-and-loose drums are 9 to 15 ft. in diameter—each drum grooved to stow 1676 ft. of 1-5/8" rope. We appreciate and gratefully acknowledge the opportunity afforded us to cooperate with the engineering executives of the Lehigh Navigation Coal Company in the design and manufacture of this great hoist and thereby to increase, importantly, our own contribution toward the winning of the war.

Write us regarding any heavy-duty hoisting requirement that will aid the war effort. Hundreds of successful installations throughout the United States and many other countries enable Vulcan engineers to make helpful suggestions—without charge or obligation of any kind.

VULCAN IRON WORKS

Established 1849

Main Office and Works **WILKES-BARRE, PA.,** New York Office 50 Church

...avy-Duty Electric Hoists
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...raper Hoists
...r-Spotting Hoists
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Vision

as an important component of professional engineering

takes on considerable significance as one checks ALLEN & GARCIA services rendered to mining properties.

Today we see that vision paying dividends to former clients through design flexibility which has allowed adjustment to meet the terrifically increased demands for coal . . . with a profit to the operator.

Sound engineering — in these times too — must parallel that of two decades ago. Thinking must be in terms of what industry will require in production and quality over the next twenty years.

A&G engineers, with visionary ability broadened by the years, are able to plan for long-time operation on a basis that is most favorable to operators — first, as pertains to competition — second, in the matter of profit.

A&G CO

ALLEN & GARCIA COMPANY

CONSULTING AND CONSTRUCTING ENGINEERS

332 S. MICHIGAN AVE., CHICAGO, ILL. · · 120 WALL ST., NEW YORK, N. Y.

QUICKEST WAY TO END AIR HOSE TROUBLE

IF your air hose isn't standing up, if you want an air carrier that can take the brutal punishment of speeded-up wartime production, change to Goodyear Redwing H Cord Air Hose.

This famous hose is even better today than it was before Pearl Harbor, because it is now built with top-grade synthetic rubber—the finest material known for resisting the deteriorating action of both oil and weather. Redwing's tube won't flake off and clog tools. Its cover won't crack from heat or cold.

In addition, the type of synthetic Goodyear uses in Redwing is highly resistant to abrasion and cutting, giving you a hose that can withstand the rough, tough abuse of heavy-duty service.

Redwing—T.M. The Goodyear Tire & Rubber Company

Many thousand feet of Goodyear Redwing H Cord Air Hose are now being used in shipyards, mines and other heavy war industries. It's preferred on these hose-killing jobs because of its long life, extreme flexibility, strength and non-kinkability. You'll buy it again and again for the same reasons.

Made in continuous lengths, in seven sizes up to 1½" diameter. Order from the G.T.M.—Goodyear Technical Man—or phone your nearest Goodyear Industrial Rubber Products Distributor.

GOODYEAR INDUSTRIAL RUBBER PRODUCTS
Let's all Back the Attack with War Bonds
GTM-Specified
Redwing H Cord Air Hose for Heavy-Duty Service
A Highest quality synthetic rubber tube, nonporous, impermeable to oil
B Multiple braids of cabled cotton cord give high safety factor
C Heavy-gauge, high-tensile cover resistant to cutting; nonoxidizing
A
B
C
GOODYEAR
THE GREATEST NAME IN RUBBER

Corrosion

* This is the 10th of a series of informative messages concerning the meaning and significance of commonly used tests and terms employed to describe the characteristics of lubricating oils.

INDUSTRIAL TYCOL OILS-GREASES

OIL IS AMMUNITION
USE IT WISELY !

DRUMS! DRUMS! DRUMS!
War needs make it extremely important that all empty drums be returned immediately.

SCIENTIFICALLY ENGINEERED FOR EVERY INDUSTRIAL USE

TYCOL

TIDE WATER LUBRICANIA

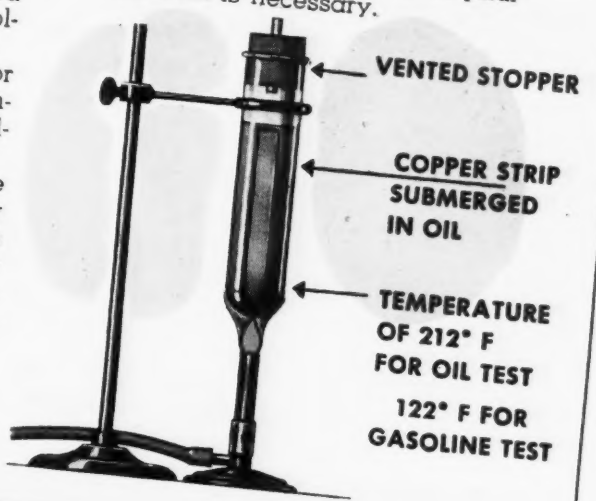
EXPLANATION: Petroleum products are frequently used in contact with metal, and when it is essential that the metal shall not be corroded, it is customary to require that the petroleum products pass an appropriate corrosion test.

TEST: The Copper Strip Corrosion Test as described in "Federal Specifications for Lubricants and Liquid Fuels" indicates the presence of free sulphur or corrosive sulphur compounds in undesirable quantities. It is conducted as follows: A clean strip of mechanically polished pure sheet copper about one-half inch wide and three inches long is placed in a clean test tube. Sufficient of the oil or liquid fuel to be tested is added to cover the copper strip completely. The test tube is closed with a vented stopper and maintained at a temperature of 212° F. for 3 hours. (If gasoline is being tested, then the temperature is held at 122° F. to avoid loss of product by distillation). The copper strip is then rinsed with sulphur-free acetone and compared with a similar strip of freshly polished copper.

The presence of free sulphur or corrosive sulphur compounds is indicated by the corrosion or discoloration of the test strip.

The sample does not "pass" the test if the discoloration of a freshly polished copper strip becomes opaque or if pitting is caused on any portion thereof. A slight discoloration is generally accepted as "passing" the test.

SIGNIFICANCE OF TEST: The Copper Strip Corrosion Test is an extremely sensitive test for indicating the presence of free sulphur or corrosive sulphur compounds in an oil. This test will detect concentrations of free sulphur as low as .001%. Variations in color of the copper strip may occur through a whole range of color shades with greens and reds predominating. Certain of these colors result from other reaction products than those caused by sulphur. These compounds may in no way be detrimental, and this fact should be taken into consideration when using this test to pass on the corrosive properties of an oil. Free sulphur colors the copper strip "black." The Copper Strip Corrosion Test is a desirable test for control of refining processes on certain types of petroleum products such as gasoline, Diesel fuel, Hypoid and All-Purpose Gear Lubricants, cutting oils and the like. It may also be used in the field for determining if sulphur compounds are present in certain oils containing additives when an active sulphur ingredient is necessary.



Tycol lubricants are made in a comprehensive line to meet each specific service requirement. Their repeatedly-proven ability to assure outstanding performance is the result of modern scientific manufacturing and rigid testing. Tide Water engineers will recommend the Tycol lubricant exactly suited to your needs – thus assuring truly efficient and economical lubrication.

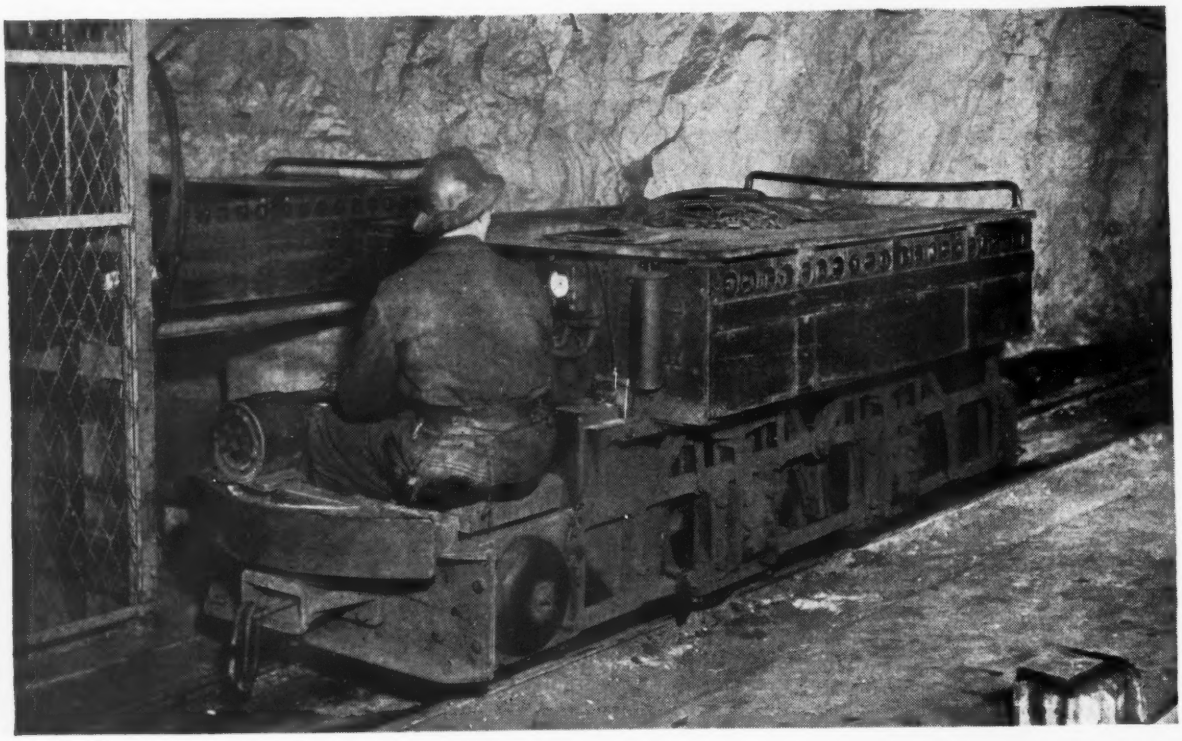
TIDE WATER ASSOCIATED OIL COMPANY

MAKERS OF THE FAMOUS VEEDOL MOTOR OIL • Eastern Division: 17 Battery Place, New York 4, N. Y.

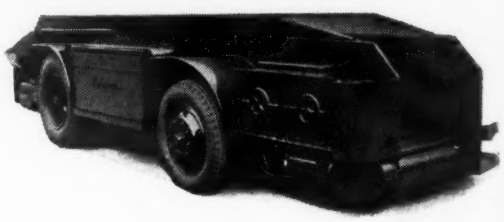
Principal Branch Offices: Boston, Philadelphia, Pittsburgh, Charlotte, N. C.

INDUSTRIAL LUBRICANTS

NEW BATTERIES FROM OLD



Alkaline batteries give the same dependable performance in both locomotives and shuttle cars.



After an Edison Alkaline Battery has delivered its normal service life in a locomotive or shuttle car and has to be replaced because the battery is no longer of sufficient capacity for the work, its cells, instead of being scrapped, are often regrouped into other batteries for lighter-duty uses for which their capacity is still ample.

The electrical departments of a number of mines have been doing just that, especially since the war created the need to conserve, thus in effect getting new batteries free which, in various standby jobs, often give many more years of dependable performance. The fact that alkaline batteries can do this is a good illustration of their unequalled dependability on the original job.

The reasons are few and simple: steel cell construction; an alkaline electrolyte that is a natural preservative of steel; a principle of operation free from self-destructive reactions. Because of their long life, simple maintenance, and trouble-free characteristics, alkaline batteries also help cut haulage costs. *Edison Storage Battery Division of Thomas A. Edison, Inc., West Orange, New Jersey.*

Edison
ALKALINE BATTERIES

Listen, wire rope users....

HAVE YOU TRIED TO GET TIGER BRAND...LATELY?

WHEN America was plunged into war, we were asked to put practically our entire wire rope production at the service of Uncle Sam. For good wire rope, in enormous quantities, was urgently required for military use.

As a result, we have had to disappoint some of our customers. They were prompt to realize that it was not only a case of military necessity but to their ultimate advantage to stand aside for the time being. We are grateful for their cooperation.

Although enormous tonnages of TIGER BRAND are still going to our fighting men and to our Allies, a steadily growing quantity is being made available for use here at home. So, when you need good wire rope, give us a call. The chances are becoming increasingly better that we may be able to supply you with your old favorite, American TIGER BRAND—today even a better product because of its war service.

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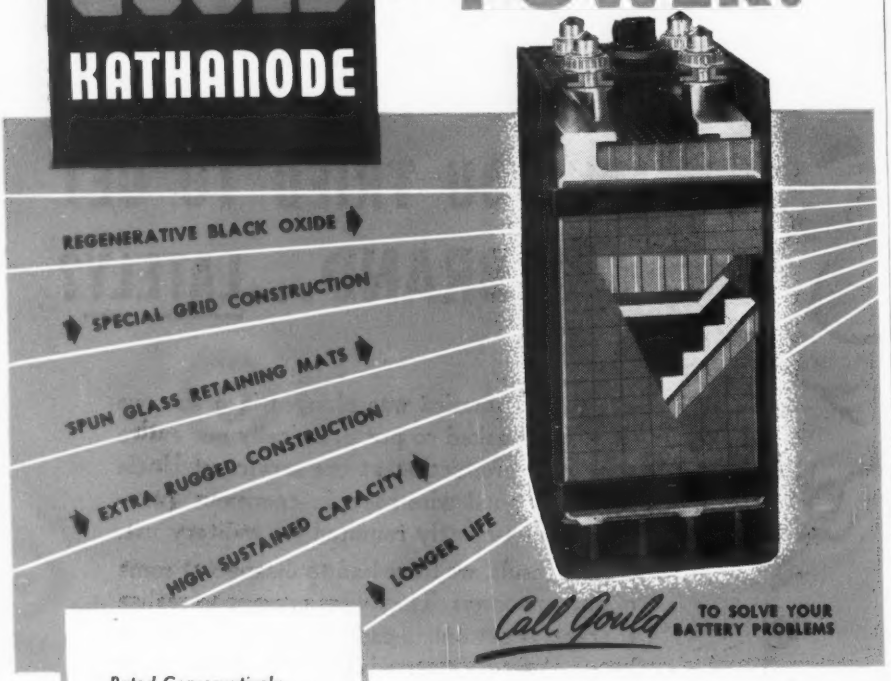

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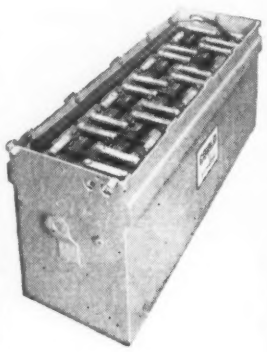
Rated Conservatively . . . Goulds equal or exceed in capacity any battery of comparable size and cell structure.



Are you receiving the monthly, informative "Gould Battery News"? If not, write for it.

Gould, the American originator of the Kathanode principle, has spent twenty years perfecting the design of this spun glass protected battery. Grids, mats and envelopes of the positive plate assembly have been brought to the point where only the smallest "spent" particles of active material can escape. And even these are replaced by the conversion of the pure lead cores that are an exclusive feature of Gould's Black Oxide positive active material.

In two decades of actual service in all types of American industry the Gould Kathanode has proved its ability to deliver low cost power. It has the sustained capacity to meet long working hours or unexpected emergencies. It will continue to do this throughout a long battery life.

There is a Gould Kathanode to fit your requirements. Get all the facts by writing today for the Gould Kathanode Bulletin, using business letterhead.

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Since 1898 THE BATTERY PICKED BY ENGINEERS

BATTERY VOLTAGE

One of a series of service suggestions for users of industrial batteries

▶ The voltage of a fully charged lead-acid storage battery in good condition is around 2.1 volts. This is true no matter how large or small the cell may be. Multiples of 2.1 volts therefore determine the voltage of your battery. If, for example, it happens to contain 15 cells, its open circuit fully charged voltage is 31.5 volts.

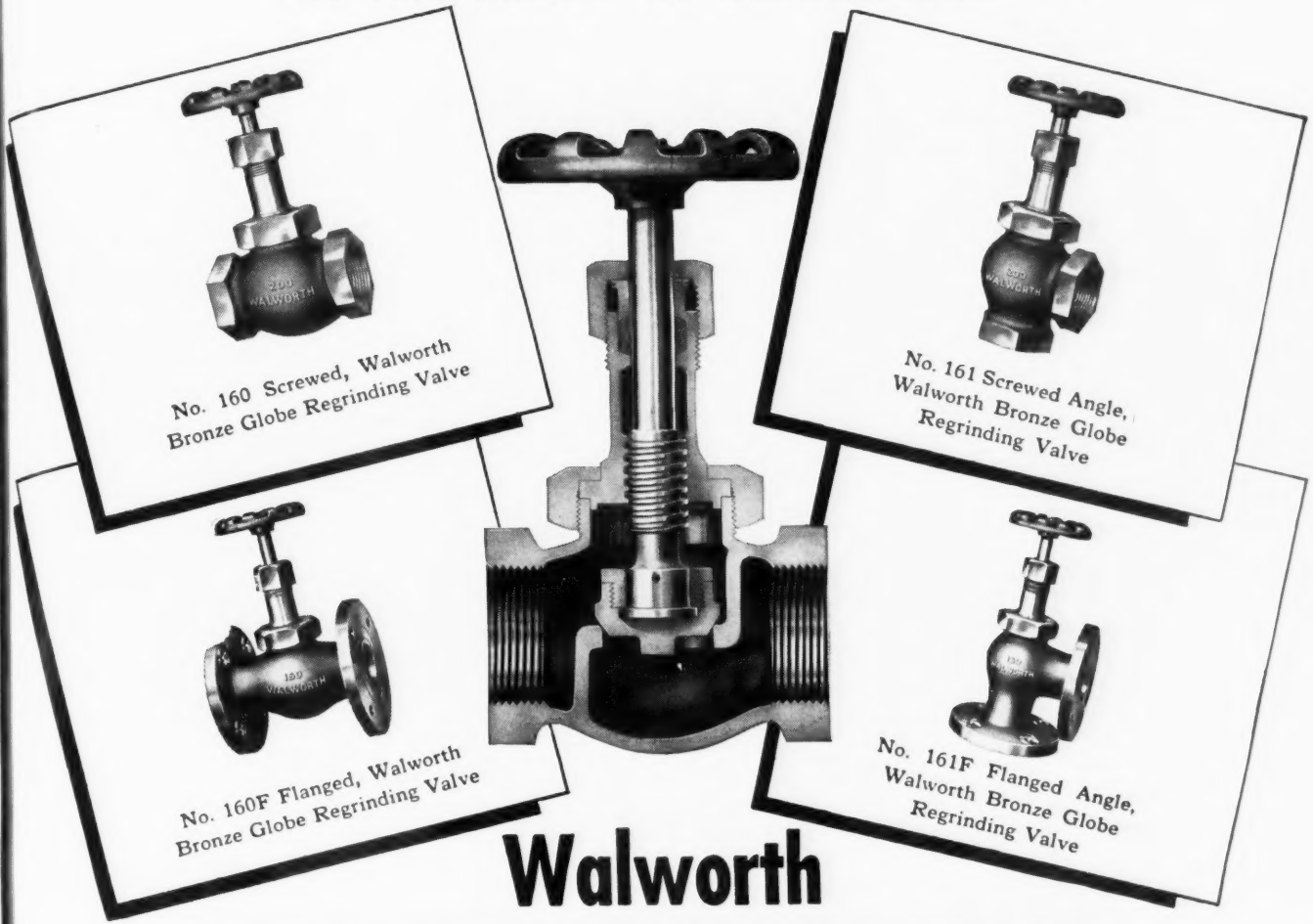
The voltage of a cell on discharge is influenced by many factors. Among these are: the cell's size, the state of charge at the beginning of discharge, the temperature of the battery and, above all, the original design and present condition.

The normal operating range for cells in cycling service is from 2.00 to 1.75 volts. However, at the very start of this discharge there is likely to be a slight drop in voltage that is shortly followed by a corresponding rise. This is due to the fact that the action is at first confined to the sulphuric acid contained in the pores of the plates.

Diffusion, or spreading, of the acid from the electrolyte to the plates is what keeps the battery discharging and the voltage delivered by each cell is directly affected by this concentration of acid in and around the pores of the plates. This operation is continuous but as more and more acid is "used up" in the discharge operation the solution becomes weaker. There is a gradual decrease in voltage until the concentration of acid in the electrolyte is too weak to supply the needs of the plates. As a result the cell voltage drops below the operational point of around 1.75 volts, and the battery is considered discharged.

Temperature also affects the voltage characteristics of a lead-cell battery. In cold weather acid increases in viscosity and thus the speed of chemical reaction is proportional to the temperature. This affects the ampere hour capacity and, therefore, a battery operating in a cold climate will not have the same operating hours as one working under more temperate conditions.

FIT THE VALVE TO THE SERVICE


No. 160 Screwed, Walworth Bronze Globe Regrinding Valve
No. 161 Screwed Angle, Walworth Bronze Globe Regrinding Valve
No. 160F Flanged, Walworth Bronze Globe Regrinding Valve
No. 161F Flanged Angle, Walworth Bronze Globe Regrinding Valve

Walworth
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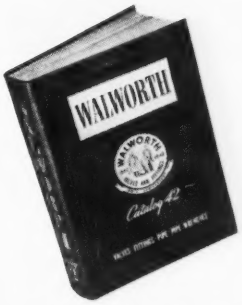
When you need a Bronze Valve select from Walworth's *complete line* the one that precisely fits your service. Take this line of regrinding valves, for example. These valves are made both in Globe and Angle types with either screwed or flanged ends. Union Bonnets give added strength. All valves have bronze discs and full-way seats. Moreover, well proportioned stuffing boxes and glands assure leak-proof operation. These valves can be repacked under pressure when fully opened, and should the seats and discs become worn, they can be reground.

Each Walworth Valve has distinctive features of design and construction. You can save time, material, and much trouble-some maintenance when you "fit the valve to the service."



To help you "fit the valve to the service," you'll find pertinent information on Walworth's complete line of valves, fittings, pipe, and pipe wrenches in the New Walworth Catalog 42. Included are 78 pages of practical engineering data that simplify valve selection and make piping layouts easier. Write, on business stationery, for your free copy. Address: Walworth Company, 60 E. 42nd St., New York 17 N. Y., Department 27.

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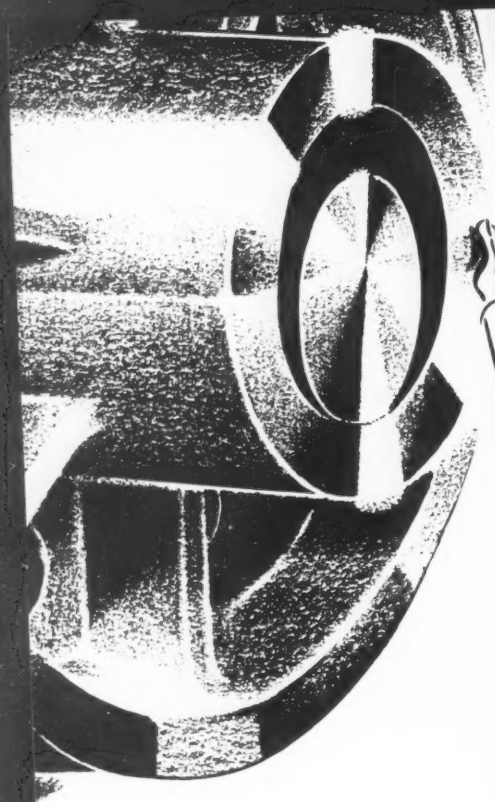

begin with the wheels

WHEN loads and/or speeds increase above a certain point, all plain and self-oiling wheels will wear out in the hub, no matter how well they are lubricated. Modern A.C.F. trucks with anti-friction bearings will meet the speed-up of the war demands — and will give you efficient equipment for years of later use at a great over-all saving.

A few new parts can often work wonders. We can supply needed new wheels, trucks, axles, bumpers, and electrically welded end sill construction with spring bumpers. Delivery of complete cars depends upon receipt of materials, and other conditions beyond our control. However, we will do our best to serve you satisfactorily, and our entire organization and manufacturing facilities are at your disposal to aid you to mine your share of the more than 650,000,000 tons of coal that will be needed in 1944!

A.C.F. Chilled Tread Mine Car Wheels, as manufactured under our heat-treating process, are made from a special mixture of metals — better for mine car wheels than steel or iron, alone.

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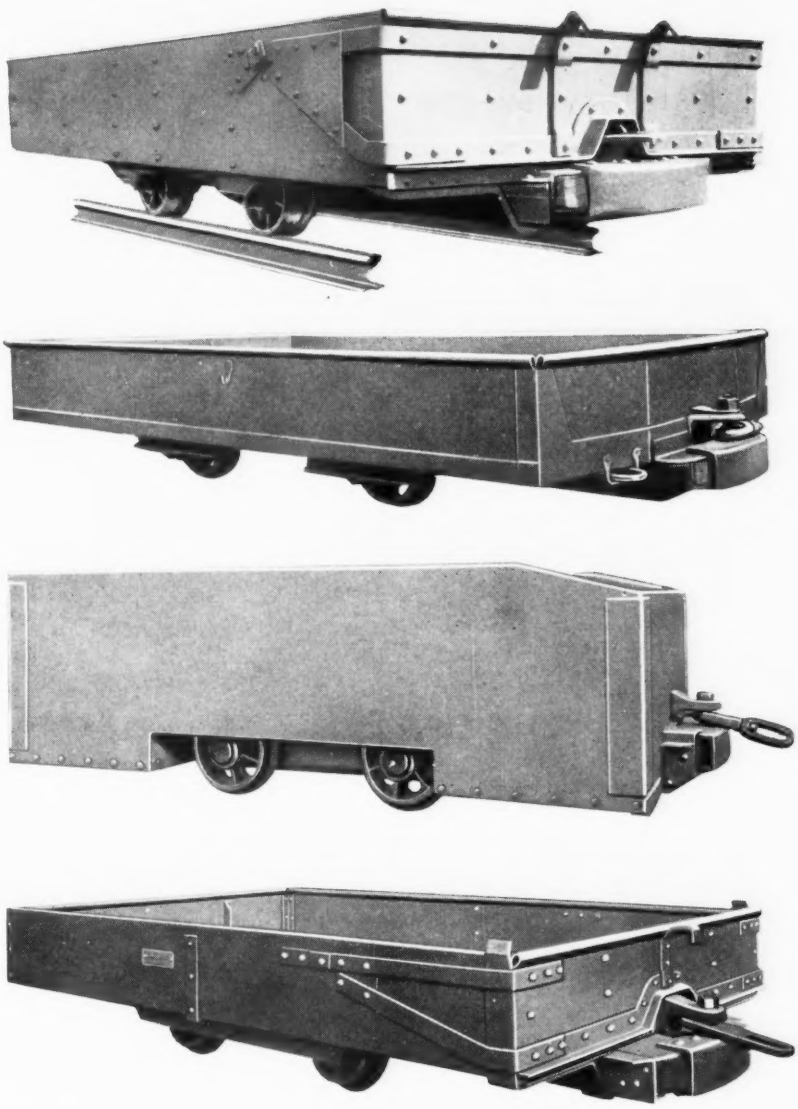

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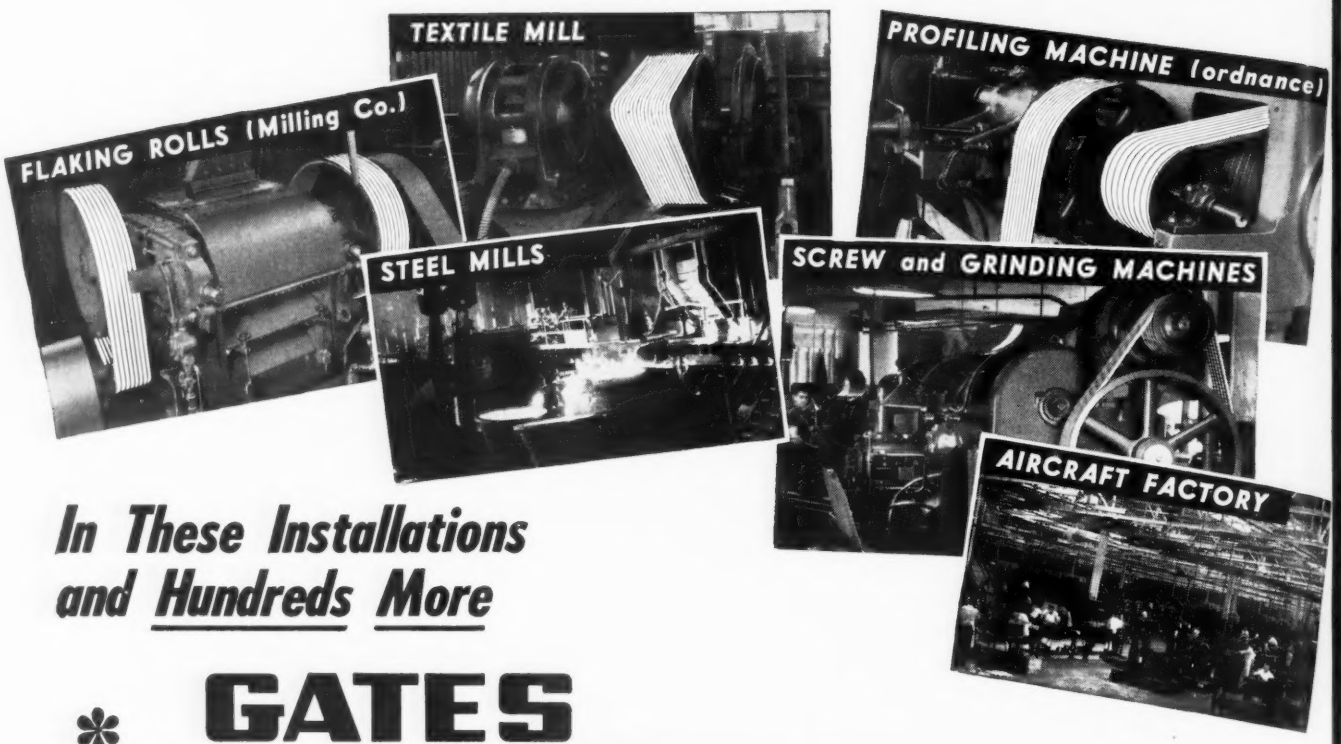

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—Are Outwearing Any NATURAL RUBBER Belts Ever Used!

MORE than 6 years ago Gates began supplying American industry with large quantities of V-Belts made entirely of SYNTHETIC rubber.

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For example:—one special synthetic rubber selected by Gates withstands oil and heat much better than natural rubber. Where oil and heat conditions are especially severe, Gates special synthetic V-Belts are giving 3 times to 4 times the service life of any natural rubber V-Belt ever used.

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CARDOX

"THE NON-EXPLOSIVE MINING METHOD"

Protects

LIVES AND PROPERTY BY REDUCING ROOF AND RIB FAILURES

Preparation Tests" TELL THE STORY...

The CARDOX mining method sold on a "Show Me" basis. A first step is "preparation tests" to demonstrate the mild effect of CARDOX on coal structure.

Cardox Engineers find that to get a true test, samples for screen analysis must be taken from 18' to 20' beyond the last fall produced by explosives. This is necessary because the structure of the coal in the intervening area is so weakened by shatter-cracks caused by explosion shocks that it is useless for test purposes.

● Two important facts stand out in the accident record of bituminous mines: (1) Approximately 51% of underground fatalities are caused by falls from roof and sides; (2) The majority of roof, face and side fall accidents are at or near the working face.

Because CARDOX acts with a slow heaving spreading and shearing action, the effect of its discharge is mild. There is little disturbance to roof and rib structure. It logically follows that roof and rib failures decrease when the CARDOX mining method is adopted. In addition, the CARDOX mining method reduces timbering problems, lowers other production costs, permits the use of longer cutter bars and rolls out the coal for maximum efficiency with mechanical loaders.

Let us demonstrate the many safety and production advantages of CARDOX by a test in your own mine.

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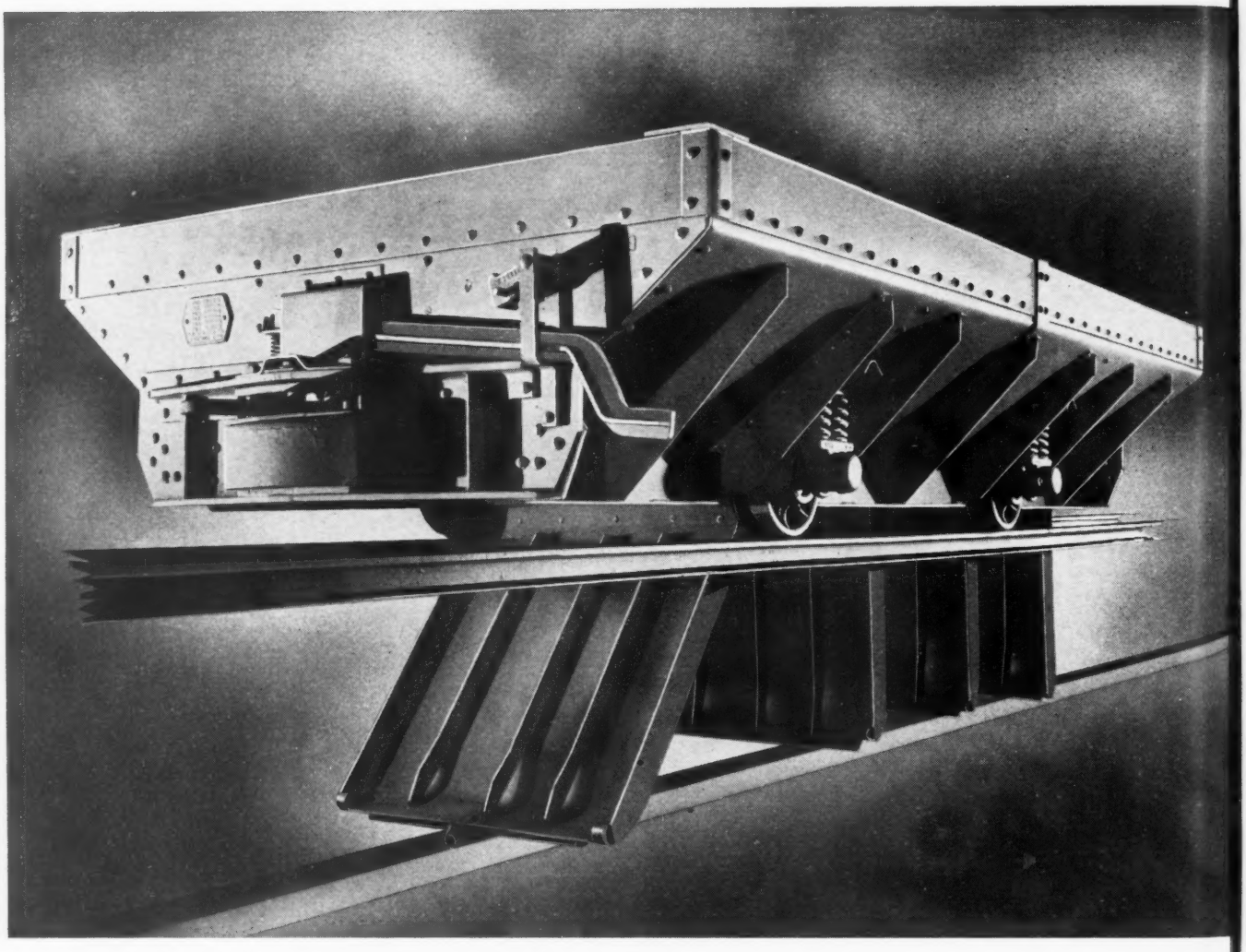
★ If You Want 'em WIDE . . —Take a Glimpse



DO YOU KNOW ABOUT OUR LIBERAL RENTAL PLAN?

★ We tell you of the many advantages of S-D 1-2-3 "Automatics" for increasing production and for cutting production costs. But we go all out to back our claims by offering you these cars on a liberal rental plan. A plan whereby your savings will more than pay the rentals. A plan with an option to purchase the cars at anytime, should you later prefer to own them. You can't lose. Why wait? Write for full details now.

Sanford-Day Iron Works, KNOXVILLE, TENNESSEE

If You Need BIG CAPACITY . . .
At This S-D 1-2-3 "Automatic"!

★ Here is another of those S-D 1-2-3 "Automatics" that make the mines that use them so successful.

This car, shown on these pages, is built for standard 56½ inch track gauge. It is approximately 9 ft. wide, 18 ft. 6 in. long, 42 in. high, and it will haul about 12 tons of coal each trip. The illustration below, with the eight men perched across the car, will give you a good idea of its extreme width.

The first forty of these S-D 1-2-3 "Automatics" have just recently been delivered to a new mine, for operators who know from experience the many advantages of S-D 1-2-3 "Automatics" in assuring maximum tonnage at minimum cost per ton.

There just isn't any other car made that can equal the efficiency of the S-D 1-2-3 "Automatic." Case after case of change-over installations prove this. And, the men in the mines who handle and load the cars like S-D "Automatics."

It makes no difference about the size. We build these remarkable mine cars in any capacity to suit your particular requirements. And, regardless of size, every S-D "Automatic" is so designed to give you minimum dead weight, and, at the same time, ample margin beyond the actual structural requirements for hard service and long life. This is why S-D "Automatics" have long been noted for their ability to take the punishment of hard service down through the years.

Sanford-Day Iron Works, KNOXVILLE, TENNESSEE

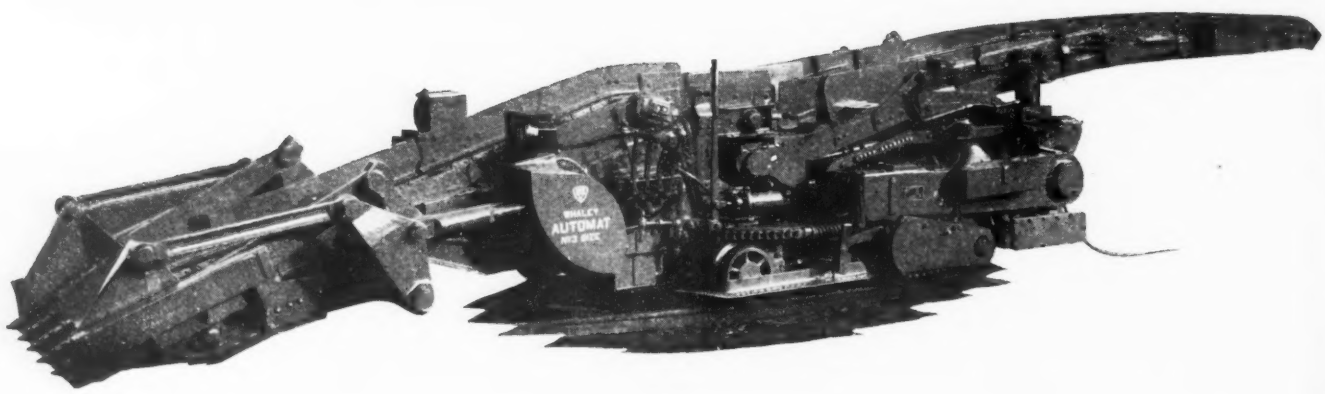
You can take it ALL— when you take it with the Whaley "Automat"

★ In many coal mines conditions warrant and make it desirable to do whole-seam loading in one operation . . . to take the coal and drawslate or partings all at the same time.

One of the major objections to whole seam loading, where cleaning facilities were available, has been due to the fact that the average coal loading machine could not stand up to the punishment of whole-seam loading and, at the same time, produce a satisfactory tonnage.

If you desire to do whole-seam loading, don't let the loading machine problem discourage you. You can do the job with the Whaley "Automat". With its natural shoveling action, the "Automat" will not only stand up but, even under the heavy duty of whole-seam loading, you'll get real tonnage. These facts have been proved conclusively by the millions of tons Whaley "Automats" have loaded and are now loading in this method of mining.

Yes, you can take it all when you take it with the Whaley "Automat". And, if you are contemplating the purchase of a new loader, you should get full particulars now. Wartime conditions have changed deliveries from weeks to months. Don't delay, write at once to Myers-Whaley Co., Proctor Addn., Knoxville 6, Tenn.



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Mechanical Loaders Exclusively For Over 36 Years . . . .

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YOU WOULDN'T
J. Berger

TAPE THE FINGERS OF A *pianist*

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Of course, this analogy is far-fetched, but it is still true that the wires and strands of non-preformed wire rope are virtually locked in position—under constant stress—uncomfortable—cranky. Being so, non-preformed cannot work so well, nor long, as Hazard LAY-SET, which is preformed at the mill and entirely relieved of internal torsional stresses and strains. LAY-SET Preformed wire rope gives you greater dollar value, requires no seizing when cut; it resists kinking and whipping; it is easier to splice and safer to handle. And, invariably, it wears longer.

Ever since Pearl Harbor, and even before, Hazard LAY-SET Preformed has been saving time and money for the Government, the Armed Forces, and the taxpayer.

Specify Hazard LAY-SET Preformed for all its built-in advantages.

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These wartime steels have proved a boon to hundreds of defense plants in meeting conditions imposed by shortages of critical material. In many cases they have performed even better than steels ordinarily used. We have been able to help many of our customers with these steels. If you have any problems connected with their use, we'll gladly assist you in determining the grades best suited to your needs.

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ROCHESTER *Ropes*

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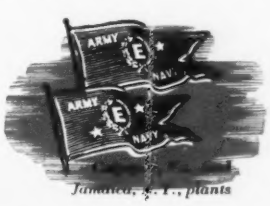

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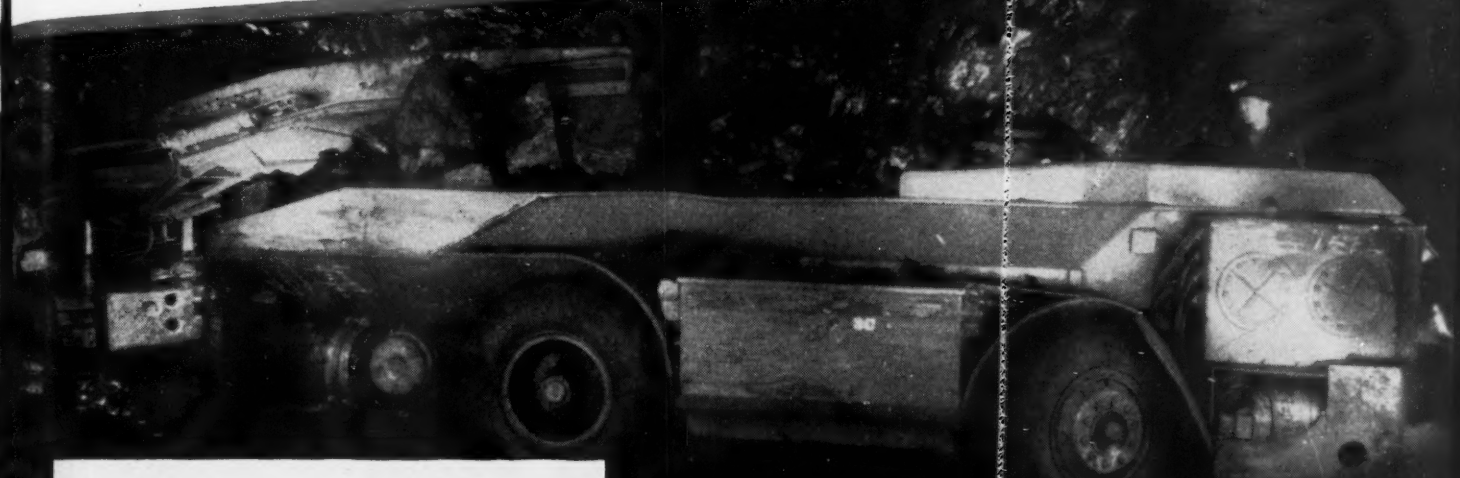
Joy Engineers design and build with an eye on the needs of tomorrow. That's why Joy equipment is always a step ahead in performance and long life.

Moves more tonnage in less time ... at lower cost per ton



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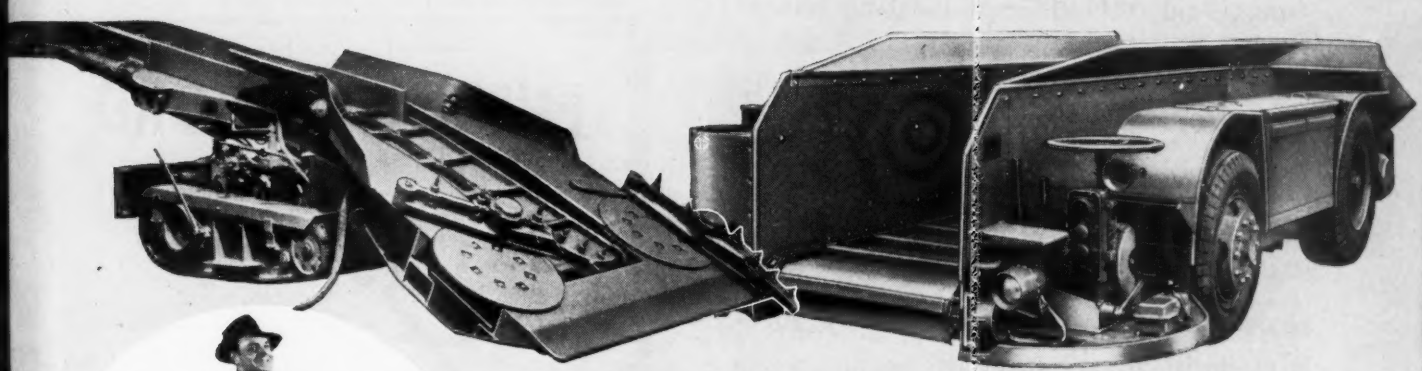
Designed by production men who know your problems

JOY LOADERS AND SHUTTLE CARS



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Designed for fast loading in seams averaging 60 inches or more in thickness. Embodies all the latest mechanical and electrical improvements.

JOY 42" SHUTTLE CAR

The continued success and constantly expanding use of this shuttle car proves it does lower section handling costs, increases mine output.

LET A JOY ENGINEER REMOVE YOUR PRODUCTION WORRIES

Joy Manufacturing Co.

FRANKLIN, PA.

Don't forget

IT'S SOMETHING TO REMEMBER — EVERY DAY

Like the parachute — a blasting charge must work right the first time.

In making up your primers just *make sure* that every little thing is right. Don't be in a hurry — a few extra seconds spent in *making sure* may prevent a misfire.

Send for the Safety Fuse Book — and remember, Ensign-Bickford Safety Fuse is made in several standard brands, each designed and field-tested to meet certain conditions. Are you sure that you are using the brand that is *best* for the conditions in your mine?

10

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Safety Fuse

Safety Fuse since 1836 . . . also Primacord-Bickford Detonating Fuse.

THE ENSIGN-BICKFORD COMPANY • SIMSBURY, CONNECTICUT

Coal Age

DEVOTED TO THE OPERATING, TECHNICAL AND BUSINESS PROBLEMS OF THE COAL-MINING INDUSTRY

Ivan A. Given, *Editor* May, 1944

New Job for Coal

IT IS NOTHING new for coal to be faced with both a challenge and an opportunity. Such situations have been frequent in the past and will continue so in the years to come, although there is good reason to feel that the opportunities will be more numerous than the challenges. War and war exigencies, however, bring to coal a new immediate problem and a new chance to serve. The problem? Making demand match a possible —even probable—gap in supply. The opportunity? Rendering real support to the war effort and solidifying coal in its place as the major source of fuel and energy.

Late developments in manpower, added to the other and increasing difficulties of operation under war conditions, already seem to forecast an involuntary slackening in coal's record production pace. But is that any reason to yield the field without a contest? The answer should be no. Now is the time for even greater pressure on more efficient use of manpower and machinery. It can yield results, as the experience of a number of operations that still are increasing output per man and per machine amply demonstrates. The more production can be maintained and, if possible, increased, the smaller will be the problem of meeting future demands.

But coal, to be on the safe side, should have a second shot in its locker—a well-implemented plan for putting its weight behind the campaign for conservation in use. The goal is a modest 5 percent, which should be fairly easy to attain. Coal can contribute much to the success of this campaign and by so doing can speed the victory while at the same time laying up valuable stores of good will for the future.

Necessary, but—

STABILITY has been the earnestly sought goal of coal mining for many, many years. To attain that objective, a majority of the bituminous industry has been willing to cede control over certain phases of its operations to the Federal Government in the past and stands ready to do so again in the future through the medium of new price and marketing legislation introduced in the House of Representatives in April. It must be admitted that powerful arguments support the stand of this majority.

The fact that legislation can be accepted as the best way out of a situation otherwise largely beyond the control of the industry need not, however, blind bituminous coal to the hazards of government regulation even though it fared fairly well under the previous coal acts. Federal regulation of certain other aspects of coal operations in war and of other industries in war and peace has been none too happy in many cases. So coal should be alert to see that any legislation that may be adopted is limited to the issue and nothing more. Furthermore, coal also should be prepared to go to bat against any other measures offered in the future which would handicap it in its attempts to render the best possible service.

Not Settled

IF IT DID NOT bear the stamp of the highest tribunal in the land, the Supreme Court decision in the ore-mine portal-to-portal case might excusably be mistaken for a typical New Deal propaganda piece. Certainly, the decision threw little light on the merits of the portal-to-portal question. But be that as it may, the question is: What does it mean to coal?

A good argument against a similar decision in coal is made by Edward R. Burke, of the Southern Coal Producers' Association. Perhaps the Supreme Court will reason the same way. And since much of the industry has been forced into acceptance of portal-to-portal by government action, the question may be academic in the long run. However, the majority in the ore case held that traveling was work and declared further that "in any event it is immaterial that there may have been a prior custom or contract not to consider certain work within the compass of the work week or not to compensate employees for certain portions of their work. The Fair Labor Standards Act was not designed to codify or perpetuate those customs and contracts which allow an employer to claim all of an employee's time while compensating him for only part of it. . . . Any custom or contract falling short of that basic policy, like an agreement to pay less than the minimum wage requirements, cannot be utilized to deprive employees of their statutory rights."

If the Supreme Court could declare traveling in coal mines to be work, which is easily conceivable, the declaration just quoted certainly would make it possible for it to reverse the decision of the trial court. Coal therefore must keep its fingers crossed for the present.

Conservation:

COAL'S NEW WARTIME JOB

The battle to make supply and demand meet grows more critical and with it the need for supplementing production with the second weapon in the coal arsenal — conservation. By intensified production and real conservation work, coal has the opportunity of accomplishing two vital objectives: a quicker end to the war and a higher standing with the public.

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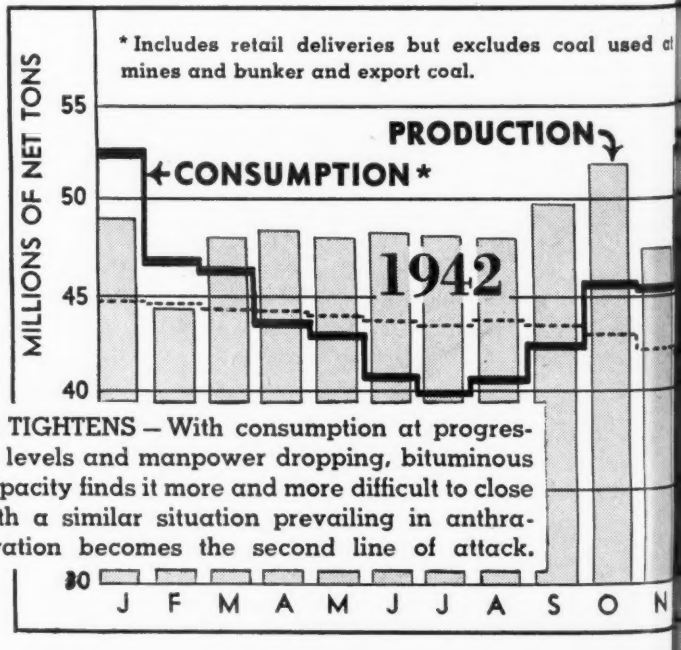
SHOULD PRESENT production trends continue, the United States faces the prospect of a coal output no greater, and possibly less, in 1944 than in 1943. If such should prove the case, there will be a gap of several millions of tons between actual output and the goals of 620,000,000 tons for bituminous and 66,000,000 tons for anthracite in 1944 for war needs and essential civilian activities.

Speculation as to when present heavy demands for coal will slacken must for the moment remain speculation. Until there is better evidence to the contrary, the only safe course is to make sure that war and essential civilian requirements are met as long as may be necessary.

Manpower is the critical factor and has been made more critical by the decision of the services to induct the majority of the men under 26. Temporary deferment of some of these young men and efforts to find men elsewhere may help the situation in coal, or at least prevent it from getting as bad as it might. Should the manpower situation be eased, and if management and men go the limit in getting out every possible ton, coal still has a chance of meeting its goals. It is not a certainty, however, and the logical step is to plan now on measures for closing any gap that may be left between supply and war and essential civilian demands.

What can be done to close any gap that may exist to prevent coupon rationing of solid fuels, to avoid the heatless days of World War I and, above all, to prevent an unjustified black eye for the coal industry? There are three broad answers: (1) taking the coal out of stockpiles; (2) maintaining or increasing production; and (3) decreasing consumption—preferably by increased efficiency, but, if necessary, by curtailing less essential uses.

Employing stockpiles to absorb any great deficiency in output can be dis-



COAL RACE TIGHTENS — With consumption at progressively higher levels and manpower dropping, bituminous producing capacity finds it more and more difficult to close the gap. With a similar situation prevailing in anthracite, conservation becomes the second line of attack.

missed quickly. The short answer is that they cannot be further reduced to any substantial degree without the risk of leaving the nation out of coal in case of a strike of any length or any material failure or slowing down of transportation. If anything, stocks should be increased rather than further reduced.

Greater production, of course, is the ideal answer. But it is an answer in part dependent upon manpower, upon machinery and upon the will of management and men to put forth their best. More unquestionably can be done to stimulate efficiency and at least prevent a needless drop in output even if it should prove impossible to offset the effects of manpower losses and other handicaps.

With maintaining or increasing the rate of production offering too many risks in the immediate future, coal must necessarily begin to plan on invoking the third remedy—decreased consumption. Cutting consumption can be done by arbitrarily reducing deliveries to consumers—a step no one is eager to take, especially in connection with war or essential industries, or, for that matter, in domestic or less essential commercial and industrial uses. But consumption can also be reduced by more efficient use—in short, conservation. The opportunities are there and there is where coal and other interested groups must be prepared to exert the major effort.

Why coal and its consumers should be facing the prospect of a shortage this coming winter is a long story. Some aspects have been treated in previous issues of *Coal Age*. It should perhaps suffice to say here that most of the causes were beyond the industry's control or were the result of governmental assumption of jurisdiction over many activities formerly considered matters for industry action. But that is no guarantee that coal may not be held responsible if a serious shortage occurs this coming winter. That is the selfish reason why coal must take every possible step to see that the shortage is prevented or kept to the absolute minimum. The unselfish one—and likewise paramount—is that it is coal's solemn duty to meet the needs of the invasion year with every ounce that can be mined.

The gap, if there should be one, can be closed. It will take a combination of production and conservation, and it will demand the cooperation of coal, government and consumer.

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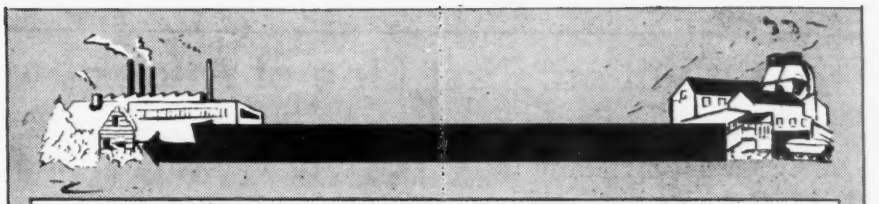


Coal and War Next Winter

PROBLEM

Closing a probable gap between supply and demand.

SOLUTION

Maintaining or increasing production by:

1. Every possible use of more efficient methods and equipment.
2. Reduction of absenteeism.
3. Tapping every possible source of manpower.
4. Increased pressure on selling management and men on their part in the war.

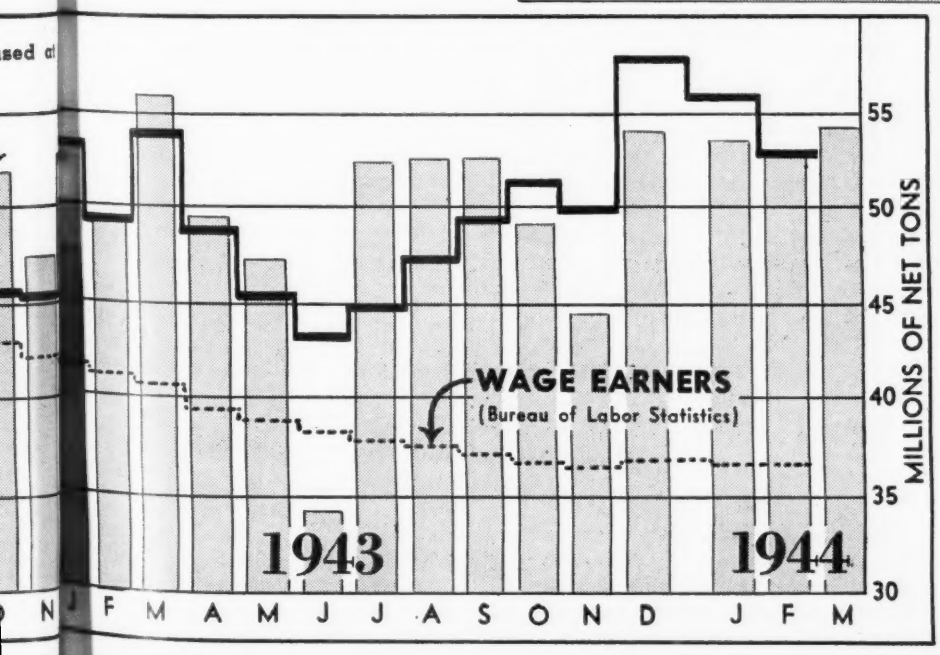
Promoting conservation in use by:

1. Adopting for the period of the emergency a new outlook on sales.
2. Organizing to promote efficiency in coal use.
3. Selling conservation to the hilt.

REWARD

Vital support of the war effort.

Enhanced public regard.



Production: First Line of Attack

Maintenance of the present rate of production and, if possible, increasing it would, of course, go far toward easing or eliminating any shortage in supplies this coming winter. There is a limit to what men and machines can accomplish but there also is good reason to believe that that limit has not yet been reached. Proof lies in the fact that a number of operations are still achieving substantial increases in output per machine and per man by intensified application of the well-known principles of efficient mining.

If ever the time has come to examine every possible method of getting out more coal it is now. The opportunities are numerous. Many, for example, were pointed out in *Coal Age's* "Modern Coal Production Number" last month. Improvements in methods, the increased use of modern equipment, more emphasis on training and upgrading of workers and other steps toward increased efficiency can do a great deal to ward off the adverse effects of a possible coal shortage. For example: if average output per man were increased only 200 lb. per shift (0.1 ton) it would mean an increase of over 11,000,000 tons in bituminous production and over 2,000,000 tons in anthracite output in 1944. A large part of the production problem, therefore, boils down to output per man-shift and raising that figure now more than ever should be the goal of management and men.

Making the best possible use of the available working force takes in more than increasing individual output, however. For instance, there is the question of absenteeism (January Coal Age, p. 46). The percentage of men staying away from work still is rising. From a low in bituminous mining of 7.9 in June, 1943, absenteeism, according to Department of Labor figures, had climbed to 10.7 in January, 1944. Anthracite's record is better but still shows an increase from 5 percent in June, 1943, to 6 percent in January, 1944.

Two major factors seem to enter into absenteeism, as borne out by a survey conducted by one large Pennsylvania company, which found the highest rates in the groups under 26 and over 45. The young men facing draft calls, or at least uncertain of their draft status, just don't give a hoot, and the older ones just can't take it six days a week. This company found that the average age of employees has risen from 36 in 1939 to 44 in 1944. That is typical of most operations.

Both the psychological factors of impending military service and the physiological factors of aching backs will continue this year. True, both the Solid Fuels Administration and the War Manpower Commission have recognized the need for ceasing to deplete coal's manpower, and miners under 26 are on the deferred list under certain circumstances in certain areas. Coal companies should make every effort to retain them by certification to local boards and are sure of SFA support. But a crystal ball is the only adequate equipment for forecasting what will happen next in the draft.

But there is a factor which might minimize the effects of absenteeism which last year cost coal the opportunity for getting out an estimated 40,000,000 tons. It also is the factor which could bring home much more forcibly to the miner his important role in the war effort and thus encourage him to work harder and more steadily. That factor is John L. Lewis. But in the face of this impending crisis Lewis has taken no steps to reduce absenteeism or increase production. Instead he demands payment of the $40 portal-to-portal pay adjustment and inferentially lays the ground for strikes to gain his objective.

Two other factors which might ease, if they did not wholly solve, the problem also are pretty much in Lewis' power. They are the employment of boys of 16 and 17 and of women. Employment of boys has been blocked by union officials, who have invoked the powers of federal regulations even where State laws otherwise would permit. In the East, also, union officials have effectually blocked employment of women in any capacity. There are many jobs where women and boys could serve without being subjected to the rigors or hazards of coal mining which tend to considerable magnification when a case is being made against their employment. The fact remains, however, that women and boys could handle efficiently many jobs in coal mining and thereby free a considerable force for work at the face where the manpower pinch is the severest.

Working a certain number of Sundays, tried successfully in the anthracite field, certainly is worthy of repetition in anthracite and emulation in bituminous. It is an easy way of adding the equivalent of a week or two weeks' production to possible output and might mean the difference between a fairly easy adjustment of supply and demand and a real crisis in fuel this coming winter.

Conservation: No. 2 Job for Coal

Efficient production and maximum utilization of available men and equipment can, as stated, do much to ease the problem of matching coal supply to demand. But taking everything into consideration, more efficient production alone cannot solve the problems of the immediate future. If for no other reason than as a second shot in the locker, coal must put its weight behind the conservation movement. It means a reversal in thinking and a united strenuous and unselfish effort to reduce the consumption of coal, preferably by increased efficiency in use, but by other methods if necessary. But it is a job that must be done, and if done well undoubtedly will bring coal mining through this war with a vastly better standing in the eyes of the public.

So far in World War II fuel conservation in the United States has not been spectacularly successful. The War Production Board undertook the task last year under its seven-industry program—oil, gas, coal, water power, electric utilities, communications and transportation—and spent close to $30,000,000 without accomplishing the desired results of an over-all 5 percent saving. Some people were unkind enough to say that one reason for the program's failure to reach its goal was the fact that bituminous coal did not give the desired cooperation. Whether that was true or not, in this year's plan there is a definite place for coal and the industry cannot afford to do otherwise than cooperate to the fullest.

The present objective again is an over-all saving of about 5 percent, although the commercial and industrial division of the conservation program has set its sights at a saving of 29,000,000 tons. The domestic division, still in the formative stages, has set no formal amount. Five percent certainly is not a difficult figure when it is remembered that Canada, facing a much graver problem, set its goal at a saving of 20 percent last year and is exceeding that figure.

What steps can coal take to insure

the success of the conservation program in this country? Broadly speaking, there are three: mental reconditioning, organization and salesmanship.

To accomplish any of them, however, it is well to understand just what the conservation program aims to do and how it is organized. Roughly speaking, it is divided into two classifications, both of which will come under the general supervision of Secretary Ickes as fuel conservator. The first is the National Fuel Efficiency Program under the direction of the Bureau of Mines. It starts with industrial plants of smaller size than the large utilities and manufacturers and ends with a four-family flat. The domestic program, still nameless but being formed, takes in smaller users than the four-family dwelling. From the utilities and other large and economical users the Bureau of Mines is recruiting the engineers and technicians who will teach the other industrial users how to burn fuel efficiently.

The industrial program is well under way, with coordinators already appointed in the principal cities and with a staff functioning in Washington. The coordinator is given a general outline of the program and the functions go something like this: The Washington office lines up regional engineers, men who know something about combustion because of their normal occupations. They work on a voluntary basis and are given identification cards. They visit plants, apartment houses, office buildings and other commercial users in their area and their first job is to sell management on the plan. Once sold, management is given a cooperating certificate for such display as it may care to make. Next a "waste-chaser" is appointed for each unit. In a factory it may be the boiler-room foreman. In an apartment building it may be the janitor. He in turn is given a series of "quiz sheets," which stimulate his checking up on all phases of heating and steam equipment, not only in the boiler room but in the distribution areas as well.

The waste chaser and the regional engineer go over the results of the quiz and recommend to management the changes to be made. Normally they would be minor improvements or adjustments; but if a major change, such as a switch to a stoker from a hand-fired unit, is indicated, that will be recommended, and the Bureau of Mines is prepared to go to bat to see that the equipment is forthcoming.

The coordinator is expected to line up men in his community who will help oversee all phases of the program: engineers, public officials, retail distributors, smoke-abatement commissioners, publicity and advertising men and representatives of industry. They will adapt the national group's program to fit their individual needs.

The domestic program will be under the direction of the Solid Fuels Administration. A staff is being formed and the program will in large measure be one of salesmanship and education to persuade the domestic user to insulate his home, adjust his heating plant and to adopt more efficient methods of firing and burning. School children and civilian defense workers are being considered as the domestic counterpart of the industrial "waste chaser." Radio, newspaper and magazine advertising, motion pictures—all the normal propaganda media—will be employed, but the program itself will be localized, with community committees named to see that it functions properly.

But what can the coal producer do to help? So far the emphasis has been on the engineer, the retailer and the consumer. That brings us back to the three major points which the industry must consider in order to discharge its part in the conservation program. The first is:

Mental Reconditioning

This possibly is the hardest step. It means that an industry which has been doing its best to built up its tonnage will now have to tell its customers to go easy. It means that bituminous men will be urging the use of the smaller sizes of anthracite, and vice versa, and that one coal company will be recommending that a customer take another company's product because all the coal that can be mined must be used, even though it may not be the coal to which the customer is accustomed.

Coal companies in addition will have to begin to preach the "philosophy of scarcity" and still safeguard against panic buying. They will have to begin to urge "getting along with what you've got and buying no more than you need."

But, perhaps most important of all, they will have to become "conservation conscious." They will have to help customers use as little coal as possible.

Cooperation

Once in the proper mental state the mechanics of conservation should be easy.

Coal companies are not going to be asked to spend a large sum of money to help put the program over, but they are going to be expected to lend their manpower to the cause. The government realizes, one of its officials said, that the expenditure of two or three million dollars right now by the industry would be impossible. But men are needed—technicians and engineers to help tell people how they can correct their heating and power losses, and how they can achieve the same results with less fuel.

Coal producers will be expected to give their time and their knowledge to the program, to have their executives serve as coordinators, which some already are; their technicians as regional engineers, their salesmen as missionaries, and their advertising and public relations men as propagandists for the program. It is not asking much, but what is asked is important.

Salesmanship

If cooperation is the answer to "What can we do?" then salesmanship is the answer to "How can we do it?"

Canada offers a good example of what salesmanship can do when everyone cooperates. There the president or chief executive of every factory was made a coal warden. He, in turn, delegated sub-wardens, whose job was to see to it that no fuel was wasted through overheating, open windows, wasted electricity or any of the small leaks that together can consume a great deal of coal. The coal warden was called on for periodic reports and he was expected to produce results.

Air-raid wardens and other civilian defense corpsmen distributed a booklet entitled "33 Ways to Conserve Fuel" throughout the Dominion. A short film was prepared on fuel conservation and shown in the middle of news reels in every theater. Theaters cut down on heating and, equally important, on cooling. Churches held union services, in some places for as many as 12 congregations. Greenhouses were held to a maximum of 45 degrees.

The two railroads operating in Canada jointly saved 1,200,000 tons of coal in one year, largely by reducing standby time and by not heating passenger cars until the train was ready to be made up. One passenger yard alone saved $7,000 by this device.

Public utilities cooperated and radio, newspaper and magazine advertisements were used to good effect.

The Dominion Government appropriated $375,000 for the job. Canada is about one-twelfth our size yet the Bureau of Mines has had to transfer $30,000 from one of its other accounts

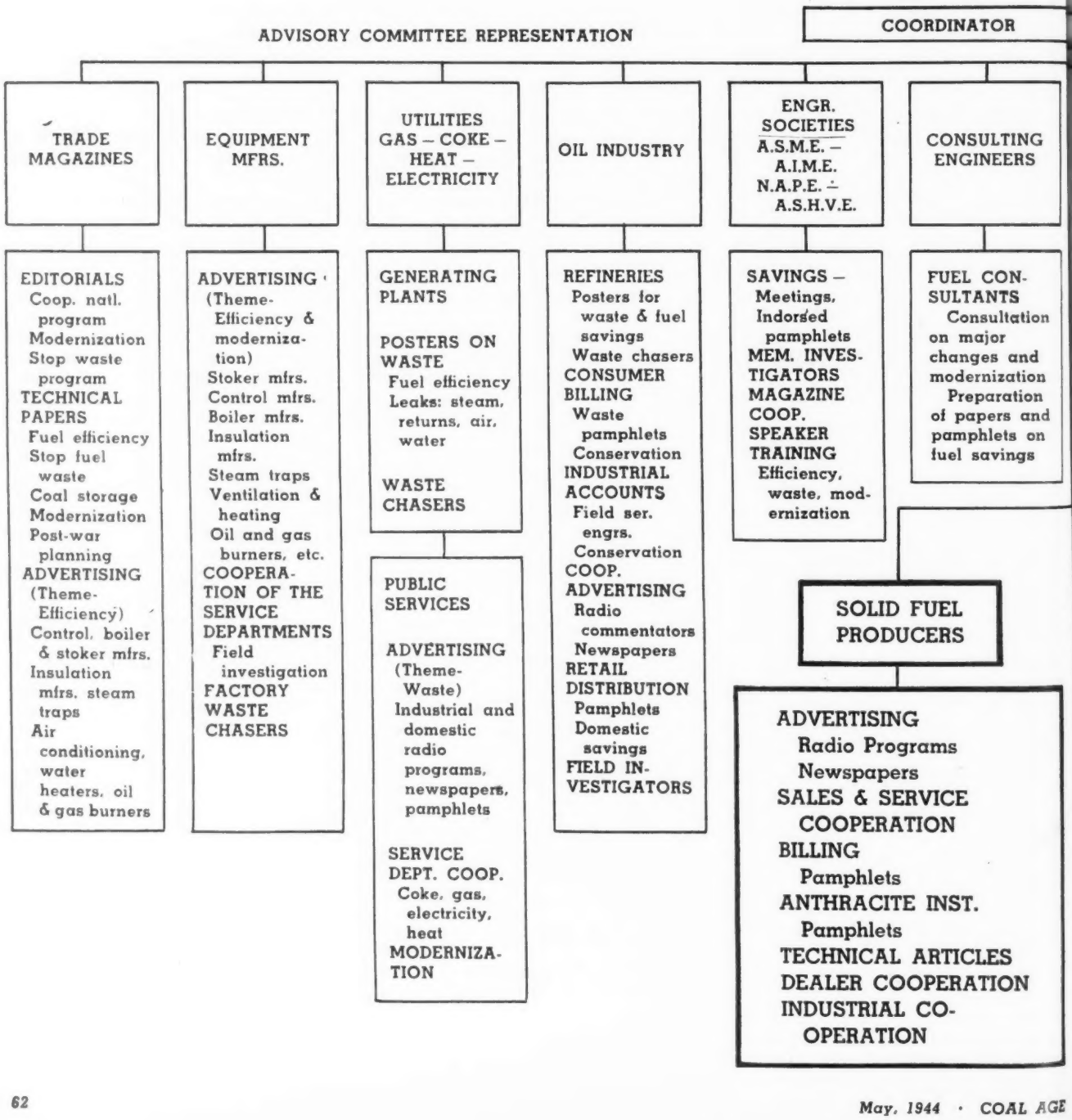
to get the present program under way. But money in sufficient amount that it will require congressional sanction is to be asked for the United States program.

The drive to conserve fuel must be carried on all year round. It cannot be a sporadic temporary campaign, and it must get down to the man who burns 8 to 10 tons a year to heat a six-room house from October to May.

Coal-producing companies can lend their sales and advertising staffs to that job, to get back of the summer stockpiling campaign, to see that dealers do not try to hoard the choicer coals, to see that distribution regulations are met and observed. In the Midwest, for instance, the SFA has told consumers using them that only 75 percent of eastern coals will be available this year and that 25 percent or more of western coals must be substituted next winter. Coal producers can help by urging that coals which will not stockpile be burned now and the firmer coals be stored for future use. In that way an even flow of production can be better maintained. A mine which cannot sell its product now finds it uneconomical to work full time and a great deal of coal is lost. But next winter the most frenzied production by everyone may not be able to meet the demand unless distribution is equitable.

Anthracite Industries, Inc. already has started on its campaign in cooperation with the program. It is now urging the filling out and filing with dealers of estimates for next winter's requirements. One of the tasks confronting the industry is to persuade consumers that a swollen estimate not only impedes the war effort but may rob a neighbor of the coal that he needs to ward off discomfort or even distress. The dealer, too, must be convinced that the new customer deserves a break as well as the old one, and in some instances he may have to talk back to the man who demands 20 tons when the dealer knows full well that 10 will do.

Anthracite plans to push the program right through the winter, concentrating on cleaning and repairing

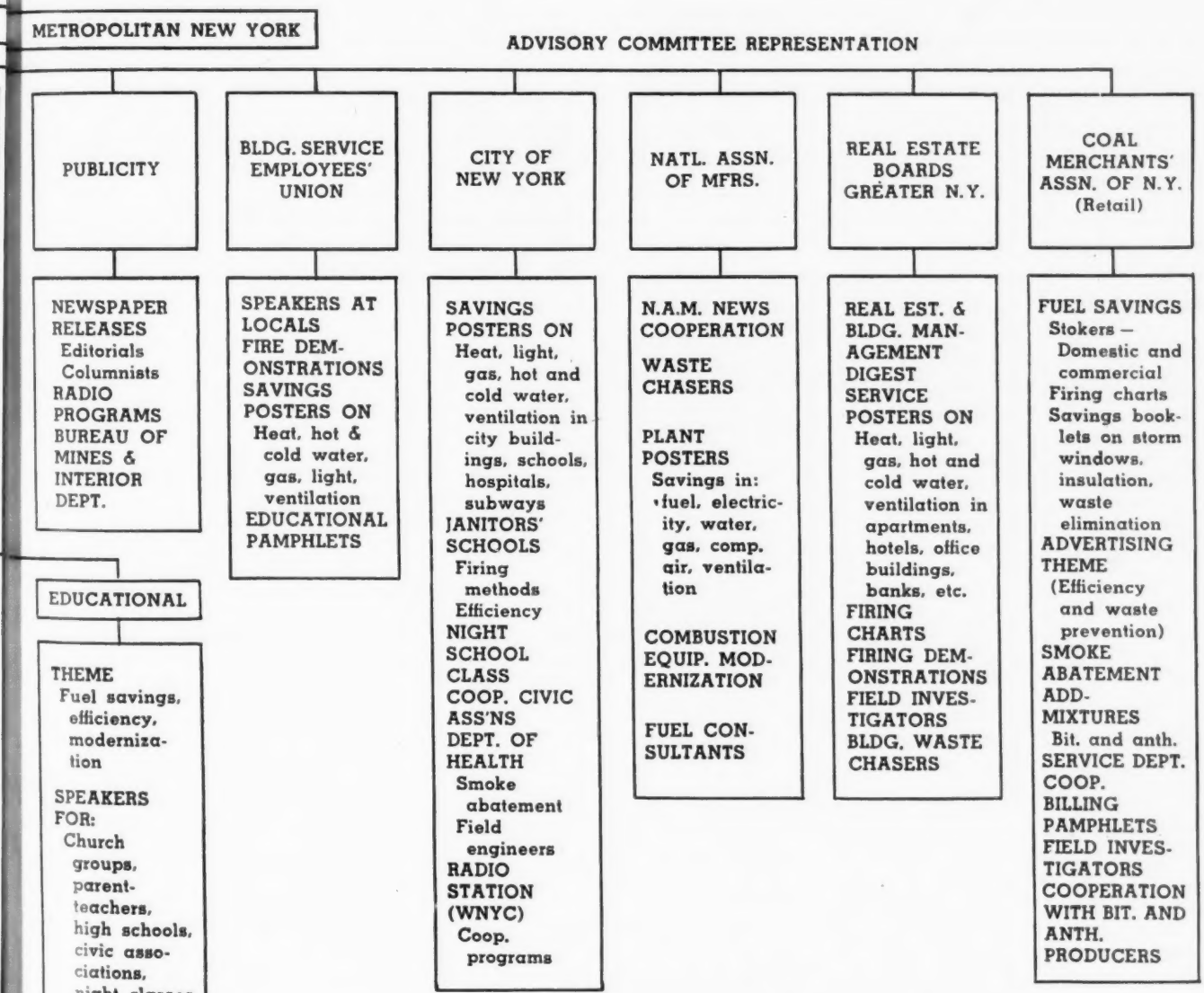


heating equipment during the summer and on efficient utilization in the fall and winter.

In discharge of the whole conservation program coal producers should willingly assume the leadership and, wherever possible, supply the manpower and the technical knowledge that will put it across. If they feel so minded they can lend financial aid by using part of their advertising budget, individual and institutionally to disseminate the message of conservation. But in any event they must demonstrate their ability to accept the responsibility of leadership.

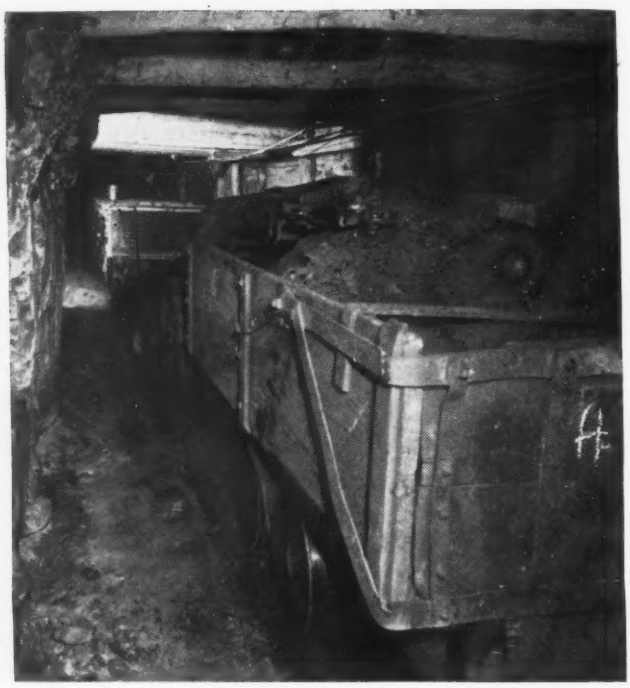
The penalties for failure of the program? Well, for one, rationing; perhaps not only of solid fuels but of all the services which solid fuels support, such as electric power, travel and civilian needs. Another? Stricter government control of the industry. But more important to the industry, the inevitable black eye with the consuming public and loss of all the good work that has been done recently and is being done now to build up coal as a progressive, modern and enlightening industry in the public mind. There is no guarantee, in the absence of concrete, constructive efforts on the part of the industry, that coal will not be blamed for a coal shortage, even if not its fault. Coal must make sure that it is not unfairly saddled with the responsibility by cooperating to the fullest in conservation and telling its story over and over. Even more important in the long run is the industry's responsibility for furthering to the best of its ability the nation's war effort.

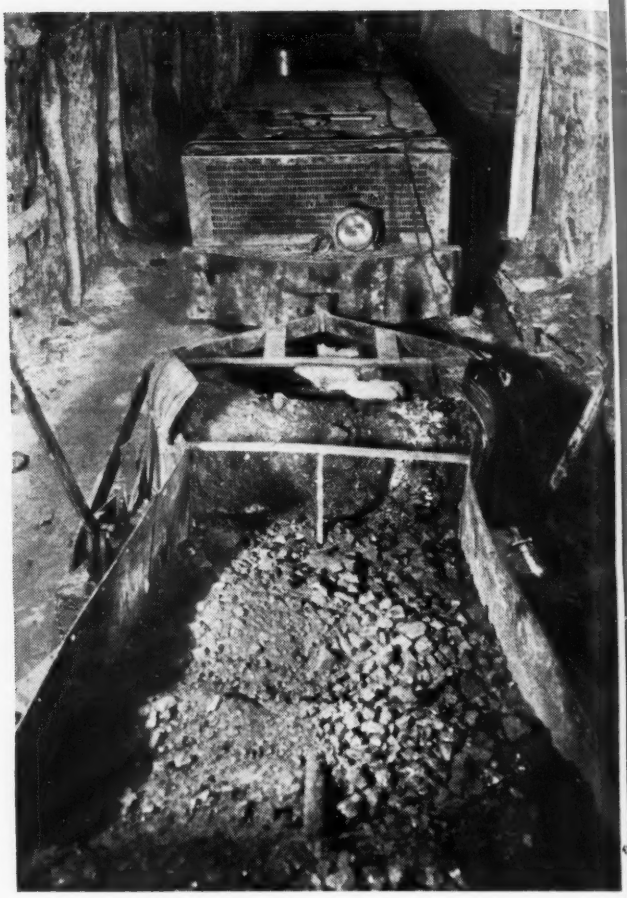
The rewards for success? Trifling, perhaps, measured in dollars and cents, but stupendous in consumer goodwill if the job is properly done. Public recognition and understanding of the industry's problems and public approbation for a job well and unselfishly done are no mean considerations, and coal can use such public applause in its portfolio of assets, to be discounted if later troubles arise. But vastly more important is the satisfaction of a patriotic job well done—a concrete contribution to quicker victory.



CONSERVATION A TASK FOR ALL

Plans for saving coal through more efficient use take in everybody from the consumer to the producer, as this organization chart for the New York area shows. Similar programs have been set up for other sections of the country.





Pulled by a 15-ton locomotive, this track cleaner travels 2 to 3 m.p.h.; handles loose, packed, or wet material, and has loaded 97 cars in three shifts with a 3-man crew.

TRACK CLEANER

Of Old Vintage Saves Its Cost Again

Built in 1936, Cleaner Enables Men to Load Nearly Three Times as Much as Is Possible by Hand—Cleans Between the Rails and Partly Outside—Requires a 15-Ton Locomotive in Hard Digging

WITH THE present labor shortage and increasing cost has come the natural trend toward revival of track-cleaning machines. That efforts to perfect them are not new is emphasized by the fact that a machine at an Ohio mine, which has paid for itself a second time in the last few months, was built nearly ten years ago. This unit, in use at No. 4 mine of the Rail & River Coal Co., Belmont County, Ohio, has nearly tripled the accomplishment per man employed at track cleaning.

Efforts at cleaning tracks mechanically doubtless date back nearly as far as experiments with mechanical coal loaders, and it is likely that a simple plow to move the material from the center of the track to windrows along the ribs was tried before that. It was in the early to middle twenties, when loading machines were proving their possibilities, that a number of operators tried these same coal loaders with modifications and/or attachments to pick up coal spillage and dirt from tracks. Few of these attempts were sufficiently successful to be continued.

The machine in use at Rail & River No. 4 mine was built in 1936 at the mine of another company, used there a year or two until the mine was closed, then lay idle until sold in May, 1943, to the Rail & River company. More of its history and early performance later.

As shown in the illustrations, all made last November, the machine consists of a two-wheeled scraper attached to a Northern high-wheeled pit-car loader, the conveyor of which was changed in width from 14 to 28 in. The scraper, with pit-car loader trailing and a mine car coupled thereto, is being pulled by a 15-ton locomotive. The job takes all that power, and more could be used. Where the pictures were made the dirt was hard packed because of rock dust, moisture drips and men walking. Even though the

Made from a two-wheeled scraper attached to a high-wheeled pit-car loader, the cleaner has been fitted with side wings to clean 6 in. outside the rails.

OTHER TRACK CLEANERS

At about the same time this machine was being developed at Cambridge, a scraper and pit-car loader was being tried for the same purpose at Saxton mine, in Indiana, but its use was not continued. Another Ohio operation, the Webb mine of the Cambria Collieries Co., is now using a track cleaner of the same general type as the one employed at Rail & River No. 4 mine.

Once over with the cleaner clears out all dirt to 4½ in. below rail tops, practically down to the ties, as E. Dishong, superintendent of mines Nos. 3 and 4, is demonstrating with his ruler.

track is practically level here, the locomotive was stalled at one point and the plow had to be raised some to reduce the load.

It is only fair to state that dirty tracks are not typical of Rail & River mines. A four-mile main haulway in No. 3 mine is noted for the excellent condition in which it has been maintained. In No. 4 mine a difficult haul plus a former uncertainty of plans for the operation was responsible for letting the tracks get quite dirty. To show how the machine performed with a heavy accumulation, an especially bad place was picked for making the pictures.

By means of two levers, one on each side, the cutting nose of the scraper is raised to miss switches, doorsills, etc. The mine car is hitched to the machine by a steel cable wound on a small-diameter drum with hand crank and ratchet so that the rope can be paid out to trim the car. This is done by a man walking beside the machine. Three men constitute a crew. The second man drives the pulling locomotive and the third operates the car-service locomotive.

Cleans in One Sweep

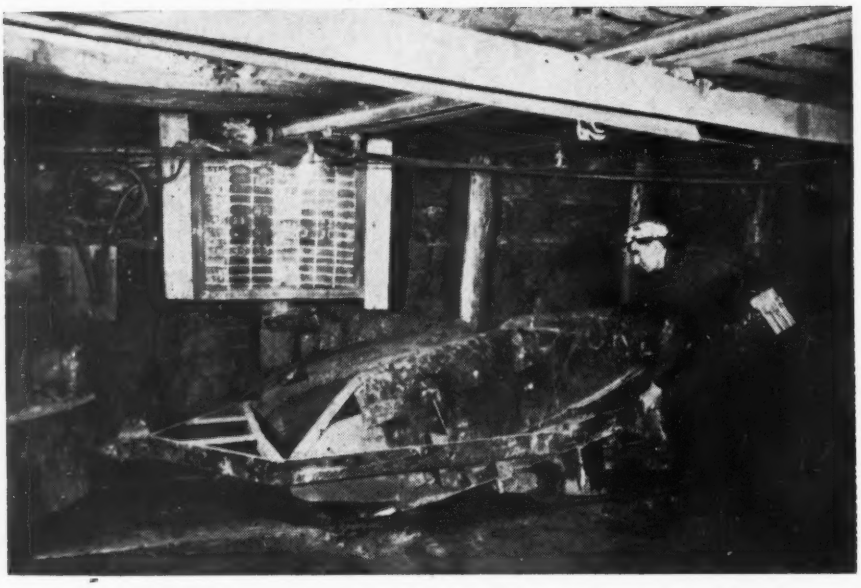
The scraper nose fits down between the rails (gage, 42 in.) and at one sweep does a nearly complete job of picking up the material if the nose height is properly adjusted. At the same time, corners extending 6 in. outside of the rails pick up material, thus digging trenches to give clearance there. Among the reasons for not extending the corners or wings to clean more of the sides are these: clearance at many points being limited by timbers or doors and heavier construction, a stronger hitch would be required and it would be necessary to use greater motive power to pull the cleaner. If hand cleaning of the sides is to be done, it is facilitated by shoveling the material over between the rails and then loading it with the machine.

Amazing is the speed at which it is practicable to pull the machine, though there be as much as 6 in. of packed material. A speed of 3 m.p.h. is entirely practicable if tracks are not too dirty and 2 m.p.h. is the approximate speed with very dirty tracks.

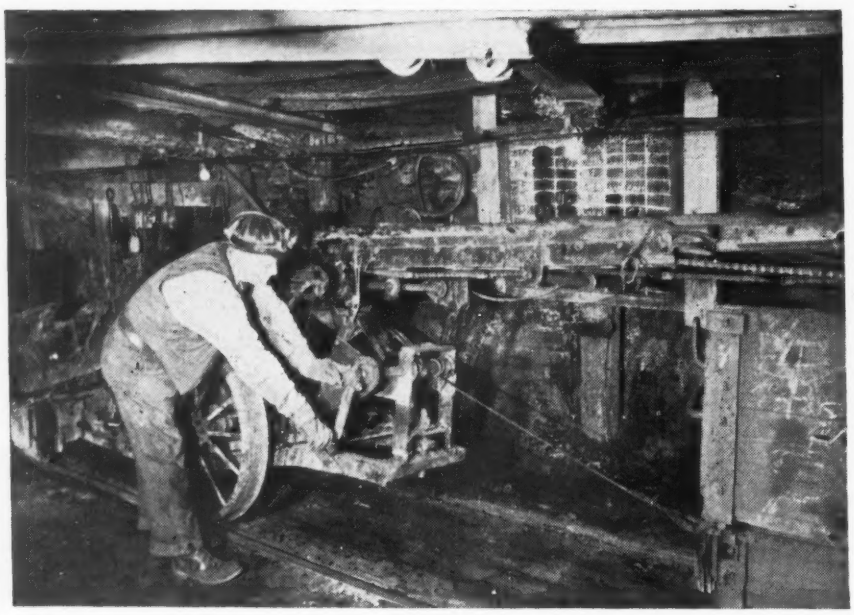
With thick accumulations the material flows into the mine car at the full capacity of the 28-in. flight conveyor and a 3-ton car is loaded in 2 minutes or less. Under the heaviest duty the conveyor lacks capacity, so at times the locomotive and machine are stopped for a few seconds while the pit-car loader conveyor is continued in operation.

97 Cars, Three Shifts

On stretches of main-line tracks far from sidetracks or turnouts the delays for car changes far exceed the working time. In this mine, however, over a total of three consecutive shifts the three-man crews using the machine loaded 97 cars of coal and rock, and in some cases the car-change delays were 7 minutes. Three men loading by



When the scraper nose strikes a track brace, doorsill or other solid obstruction the locomotive slips its wheels. It then backs up. The nose is raised by a lever far enough to clear and then let down again.



A hand winch and cable are used to adjust the distance between cleaner and car as required to trim the load.

hand with shovels do very well to load twelve cars in a shift.

How does the machine act in sticky mud? E. Dishong, recently appointed superintendent of No. 3 and No. 4 mines, states that to his amazement the machine worked even better under that condition. The material flows back more readily over the scraper and onto the conveyor. And what happens if the scraper catches on the sill where a door had once been or on a track brace? Nothing, except that the locomotive is stalled and its wheels slip. Then the machine is backed up a foot or so and the obstruction either moved or the scraper nose lifted.

John T. Sydnor, who was elected president of the Rail & River Coal Co. a few months ago, expressed surprise upon learning of the existence of a track-cleaning machine as practical as this one has proved in No. 4 mine. E. F. Maurer, who under the former management was superintendent of No. 3 mine, is now general superintendent of the three mines of the company and reports to Mr. Sydnor.

This particular machine now in use at No. 4 was built in 1936 at Walhonding No. 2 mine of the Cambridge Collieries Co., near Cambridge, Ohio, by Ellis E. Allbright, chief electrician, and W. H. Huddy, superintendent. H. E. Cameron, general superintendent, cooperated with them in the project. Messrs. Albright and Huddy, now in similar positions with the Detroit Mining Co., Gordon, W. Va., when interviewed recently recalled many interesting experiences in developing and using the machine.

To perfect a balance, so that in hard digging the scraper would not tip down too far and gouge the ties and yet would not kick up out of the material, the hitching had to be redesigned so many times they lost track of the number. Walhonding, which produced 2,000 tons per day, was quite hilly and the cars were very leaky. To pick up the excessive accumulations required two 15-ton locomotives in tandem to pull the machine up some of the grades. A 10-ton locomotive is too small for the work in most cases.

After the 3-mile haul in Walhonding was given its initial cleaning the machine was pulled over it once a week on an idle day. Three men sometimes would complete the 3 miles by lunch and after that would clean some of the heading entries, thus doing about 4 miles in a 7-hour shift.

1½-Minute Loading

Record cleanings were 65 to 75 3-ton cars per shift and very often a car would be loaded in 1½ minutes. Detachable and adjustable wings or mold boards that reached 17 in. (maximum) outside of the rails were tried, but with indifferent success. These were attached for one cleaning per month. It was difficult to make these wings strong enough to stand catching on obstructions. When the flight conveyor of the Northern pit-car loader was widened, a third chain was added in the center, thus using two standard 14-in. flights.

Mr. Albright relates an incident that gave him the idea for building the machine: On the task of pulling a Jeffrey 35-B shortwall out of a section to a shop for repairs, the equipment got stuck on a stretch of track that was exceptionally dirty. He solved that immediate problem by unloading the machine, then, with a locomotive, pulling the machine truck along over the track so that the front end scooped up and plowed over to the sides enough of the material to permit the machine to get through after it had been reloaded onto its truck.

Walhonding was closed and dismantled about 1938 and soon after that the much-used track cleaner was sold to the American Mine Door Co., Canton, Ohio. That company resold it to the Rail & River company after using it to get ideas for a machine that it has under development and test.

STREAMLINED SHOP
Speeds Maintenance Work at Hanna

Team System at New Georgetown Central Shop Develops Experts on All Equipment and Reduces Costs — Crew Turns Out Completely Rebuilt Loader in Three Weeks by Use of Standardized Practices

DESIGNED primarily for the complete rebuilding of underground mining equipment, the new central machine shop of the Hanna Coal Co. at its Georgetown (Ohio) No. 12 mine is already proving its worth, after five months of operation, in at least three directions. It is developing expert mechanics for all types of mining equipment used by the company. It is producing quicker and cheaper work. And it is standardizing repair work and rebuilding projects for all seven of Hanna's mines.

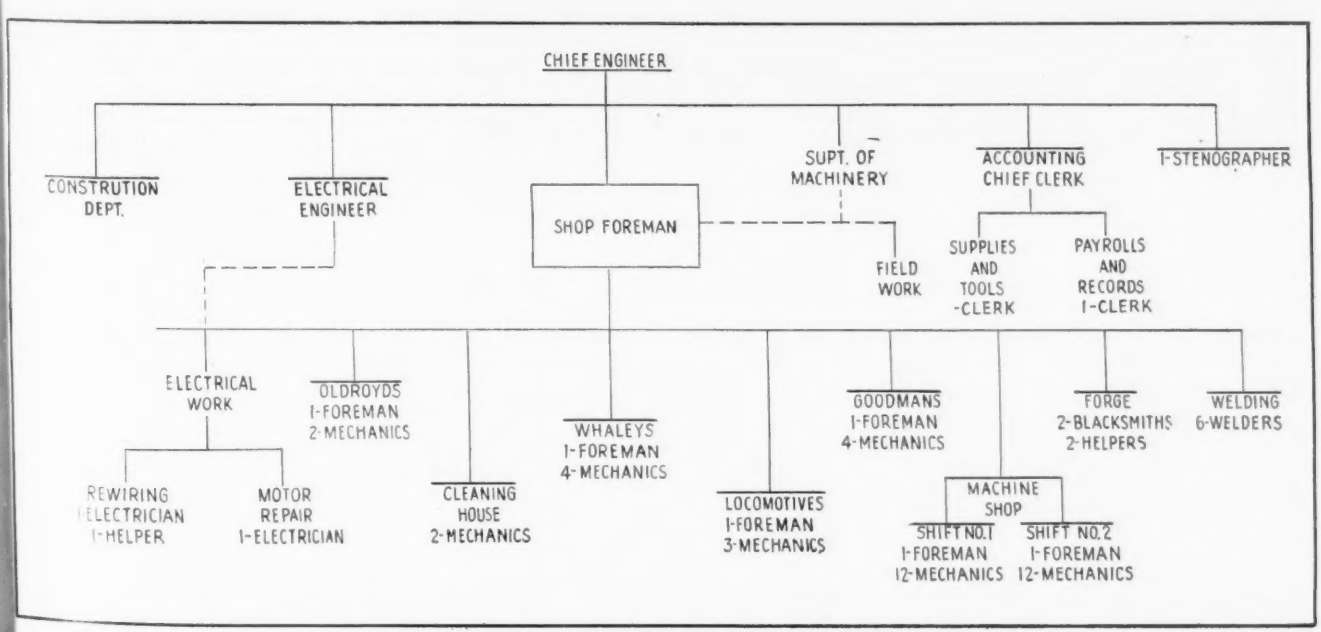
While the bulk of repair and maintenance work is still done at the individual mines, the larger jobs are moved into the big shop at Georgetown. Some idea of the work done there may be gathered from the average of 3 to 3½ weeks for the complete rebuilding of a loader. When the job is finished the loader is as good as new.

Hanna's central machine shop formerly was located at Piney Fork, Jefferson County, but most of the rebuilding work was done at the individual mines. The Piney Fork shop became so overcrowded, even with the limited volume of work being done there, that new quarters were imperative. The Georgetown plant was the result. It is a rectangular building, two stories high, 213x95 ft. inside, constructed of concrete blocks. It is purely functional in design, and by spring Hanna officials hope landscaping will have softened some of the severity of its appearance.

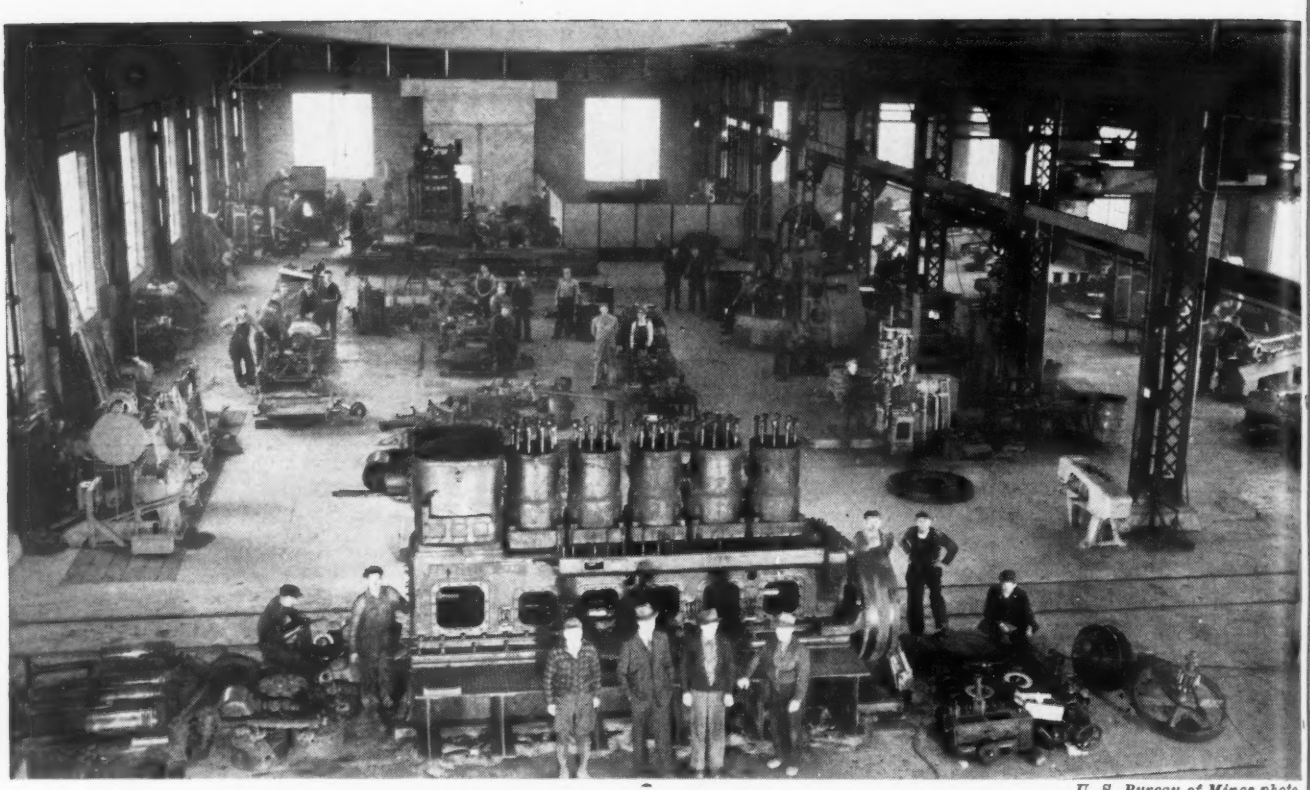
Hanna officials admit that they had

U. S. Bureau of Mines photo.

Utility is the keynote of the design of the new Hanna Coal Co. machine shop at Georgetown, Ohio. This outside view shows the front and east side of the building.

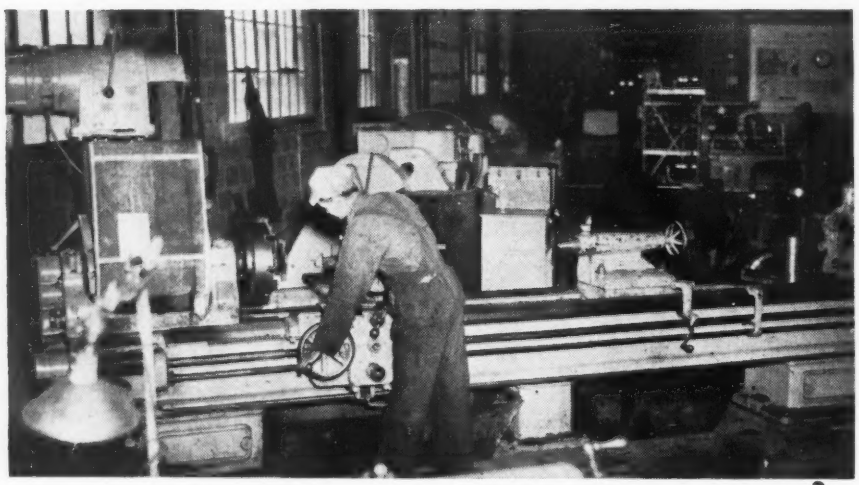


How the Georgetown shop is set up to take care of supplies and rebuilding.



U. S. Bureau of Mines photo.

General view of the Georgetown shop from the balcony floor. In the foreground is the diesel engine for the stripping dragline. Behind it are working spaces for underground equipment crews, the welding shop and the forge. The overhead crane has a span of 60 ft. At the right is the 5-ton crane for the machine shop.



A section of the machine shop looking north toward the electrical shop. In the foreground, a machinist at work on one of the heavy-duty lathes.

to cut some corners and show some ingenuity to obtain materials for the building, but the equipment was another matter. Most of it was already in use at Piney Fork. Some new pieces were added, notably the 20-ton overhead traveling crane. But what was more essential than equipment was space and a more centralized working plan, so, when the equipment was moved in, careful attention was paid to the floor plan.

Starting from the southeast corner of the building, the rebuilding department is laid out as follows: forges, welding shop, locomotive repair, Whaley and Goodman machines and stripping equipment. Across the northeast end are the supply bins, the tool room, the shop foreman's office and the shipping and receiving department.

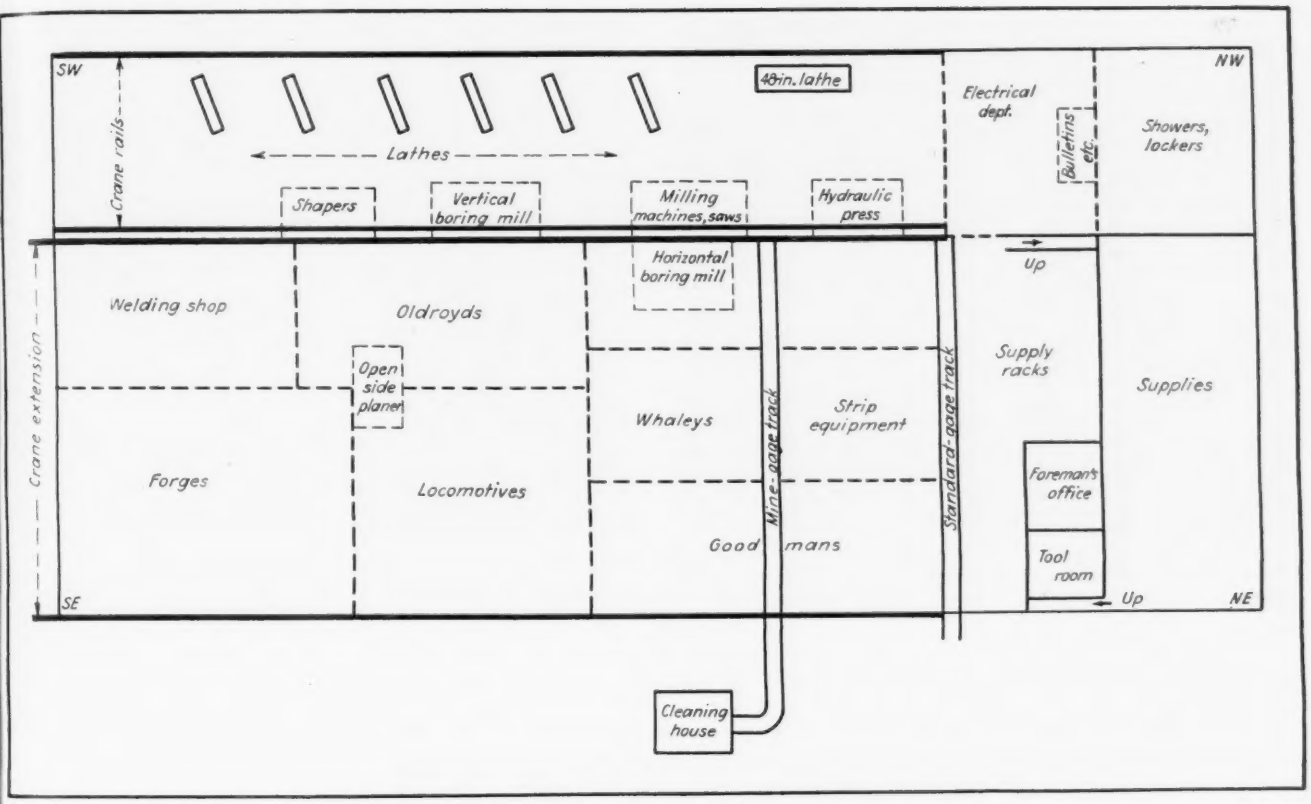
Chief Engineer Thomas G. Fear has instituted a novel idea in the supply room by having bins numbered according to size. For instance, all bins from 101 to 150 are a certain size, and from 301 to 330, etc., depending on capacity. These are broken down further by letter designations, and each designation is transferred to a Kardex system card. The result is that the supply clerk can lay his hands on any given item in a matter of seconds. This has the further advantage of also permitting the supply clerk time enough to act as tool-room clerk, where a modification of the same system will be installed. The tool room is not yet complete, but will be set up on a similar basis.

The Georgetown shop acts as a sort of central supply depot for all the mines, so the matter of being able to find supplies quickly becomes important as a time-saving element.

To avoid confusion in the repair of small parts, some of which is done at the central machine shop, bins have been constructed, two for each mine. One is for outgoing material and one for incoming.

Steel bars and sheets and other metal equipment too large for storage in bins is kept in racks in front of the supply room. Racks for steel bars, each graded according to size, have already been installed, and similarly graded racks for sheet steel are soon to be added, as well as an A bin for bars.

The machine shop is located along the west side of the building with the equipment set up in two parallel rows running the length of the shop. This shop has its own 5-ton lifting crane with a 35-ft. span. The electrical shop is located in the northwest cor-



Space for supplies, offices and the use of men is provided in the Georgetown shop plan, in addition to a machine shop and rebuilding facilities.

ner of the building, and behind it are the showers, lockers and toilets.

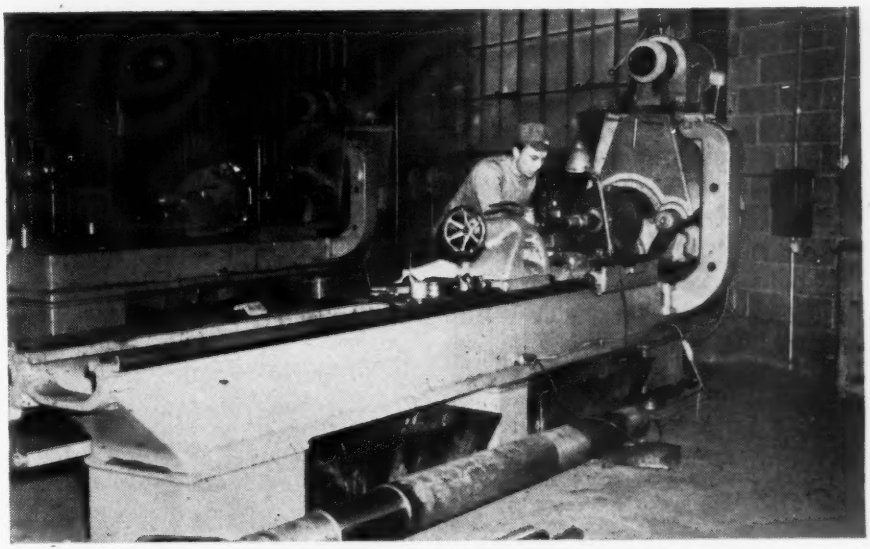
The shop's honor roll is posted just above the time-sheet desk, which is located between the electrical shop and the lockers. The men keep their own time sheets. Ten names are on the honor roll, and three of them are the sons of Bert Simonson, superintendent of machinery.

Machine-shop equipment includes the following:

One horizontal boring mill.
One vertical boring mill.
Two air compressors.
One 16-in. shaper.
One 20-in. shaper.
One 20-in. lathe.
One 16-in. lathe.
One 24-in. heavy-duty lathe.
Three 24-in. standard lathes.
One 48-in lathe.
One bolt threader.
One 300-ton hydraulic press.
One milling machine.
Two power saws.
Two grinders.

All the machine tools are individually powered with Lima drives. Some of the equipment is prewar. Other pieces were bought secondhand.

Tool boxes are located alongside each machine and work benches were placed only after the most careful study of the most convenient locations for the machine operators. Virtually the whole west side of the machine shop is composed of windows which afford a maximum of daytime lighting. Floodlighting is being installed to give the best nighttime lighting possible.

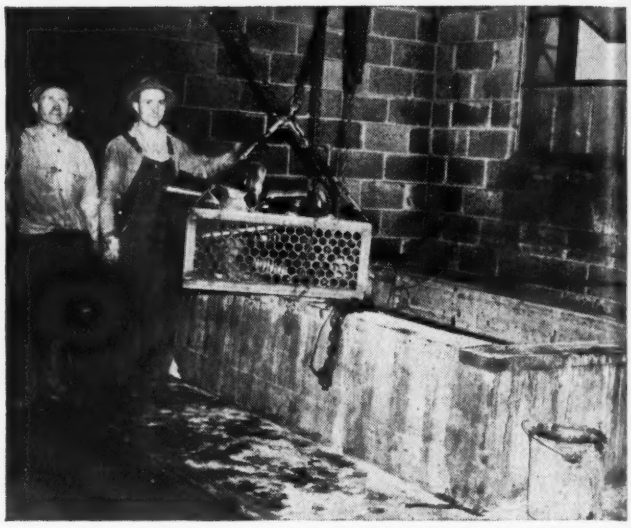


Two of the lathes in the Hanna shop. The machines and work benches are arranged so that the light comes in over the workmen's left shoulders.

Rebuilding department equipment includes the forges, a 14 x 6 open-side planer, three electric and one portable welding machines. A storage-battery locomotive runs the width of the shop floor to move pieces of machinery from the shop to the cleaning plant, located in a building by itself, a few feet to the east of the main structure. Another track runs along the north end of the shop to accommodate standard-gage railroad cars.

One of the innovations in the rebuilding department is a 22-ft.-long crane extension, operated through drop windows, to permit the traveling crane to work outside the building. When equipment arrives which is too big to be brought into the shop in one piece, it is stored outside, taken apart and brought into the shop in sections by

Part of the rebuilding department's function is repair of electric motors. Shown here is a part of the electric power repair section.



Mechanics about to lower a basket of dirty parts into a 5-ft. concrete bath in the cleaning house adjacent to the machine shop.

the crane. Inside, the crane operates on a 60-ft. span.

The rebuilding department and the machine shop are both two stories high, although the machine shop has a slightly lower ceiling. On the balcony floor which overlooks the rebuilding department from the north end are the staff offices. Also, on that platform are a lunchroom which will be furnished with a hotplate and radio, although no meals will be served. Wartime priorities have so far prevented the company's obtaining all the necessary lunchroom equipment.

The cleaning house, in charge of two mechanics, is located outside the main building and connected to it by the electric locomotive track. Equipment arriving from the mines is sent here from the floor of the shop and lowered in steel nets by block and tackle into concrete vats 5 ft. deep. The vats are heated by steam coils along the sides, and the equipment is given a bath in an Oakite solution for anywhere from 12 to 24 hours. The Oakite solution prevents rust during the cleaning bath.

Hanna operates the machine shop work on a modified version of the assembly line. For instance, a Goodman loader at one of the mines needs rebuilding. Since Hanna's operations are sprawled over three counties in Ohio (Belmont, Jefferson and Harrison), this may mean as much as a 25-mile trip to the Georgetown shop. The equipment is brought in by truck, and if it is too large to be taken to the floor in one piece it is dismantled outside in the yard and brought into the shop by the crane. Otherwise, it is moved right onto the floor.

A work schedule is laid out for the machine, and under ideal conditions all jobs will be finished at the same time and the assembly and repaint job will take place at the loader section of the floor under the supervision of the team specializing on loaders. In the instance of the Goodman loader, the job would be under the supervision of the foreman and four mechanics, who do nothing except work on Goodman equipment.

The motor is routed to the electrical department for rebuilding or for such repair as is necessary. The machine shop takes care of boring, planing and milling. Many of the parts are made in the machine shop and others are purchased. The blacksmiths and the welders both have their assigned tasks which fit into the whole project. When work on all the parts has been completed, they are brought back to the loader section of the floor and the loader team goes to work on them.

Help at Mines

While that type of work is the principal reason for the machine shop's existence, it does not stop there. It is not the practice to bring in a section of equipment for repair at the central shop, but sometimes it is done. Maintenance and repair work are still jobs for the crews at the mines, but because the practice at Georgetown has been to develop through the team method, experts on each type of machinery used by the company mechanics often are sent from the central shop as trouble shooters to the various mines.

In addition, the central shop also takes care of all the work on the Georgetown stripping equipment. As a matter of fact, it is that circumstance that sometimes upsets what otherwise would be an ideal work arrangement. Stripping equipment receives a measure of priority in repairs when serious breakdown occurs, and a boring mill, busy with a cutter, may have to be taken off that job to take care of a piece of strip equipment. Obviously, this sometimes will retard the finishing time for rebuilding the cutter.

Hanna has been fairly well fixed for manpower in its machine shop. The only exception is welders. One reason for this availability of men is the in-shop training system by which apprentice mechanics are trained, generally on the night shift, under the joint supervision of company foremen and State instructors.

The rebuilding department works one shift and the machine shop two.

The work sections of the rebuilding department are marked off by yellow bands painted on the floor and the various teams are supposed to stay inside them except when they have to go out for parts or for various other reasons. There is plenty of room in which to move around in the Georgetown shop.

The construction department and the electrical engineer have their headquarters at the machine shop, thus integrating all the engineering work of the company under one roof. In addition, Mr. Fear has charge of the safety department, which makes its base of operations at the machine shop.

One of a number of innovations installed at the shop is a public address system which permits calls for supervisors to be heard over shop noise.

The shop employs 86 persons, including clerical help. Hanna officials thought the new facilities would be able to take care of any ordinary needs for some time; but so big is the volume of work being done that its capacity already is taxed.

RECTIFIERS
Meet New Consolidated Power Demands

Favorable Installation, Operating and Maintenance Characteristics Result in Rectifier Choice for Consolidated Mines — Sealed-Tube Units Purchased for Three Different Operations

By C. C. CONWAY
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And F. B. HICKMAN
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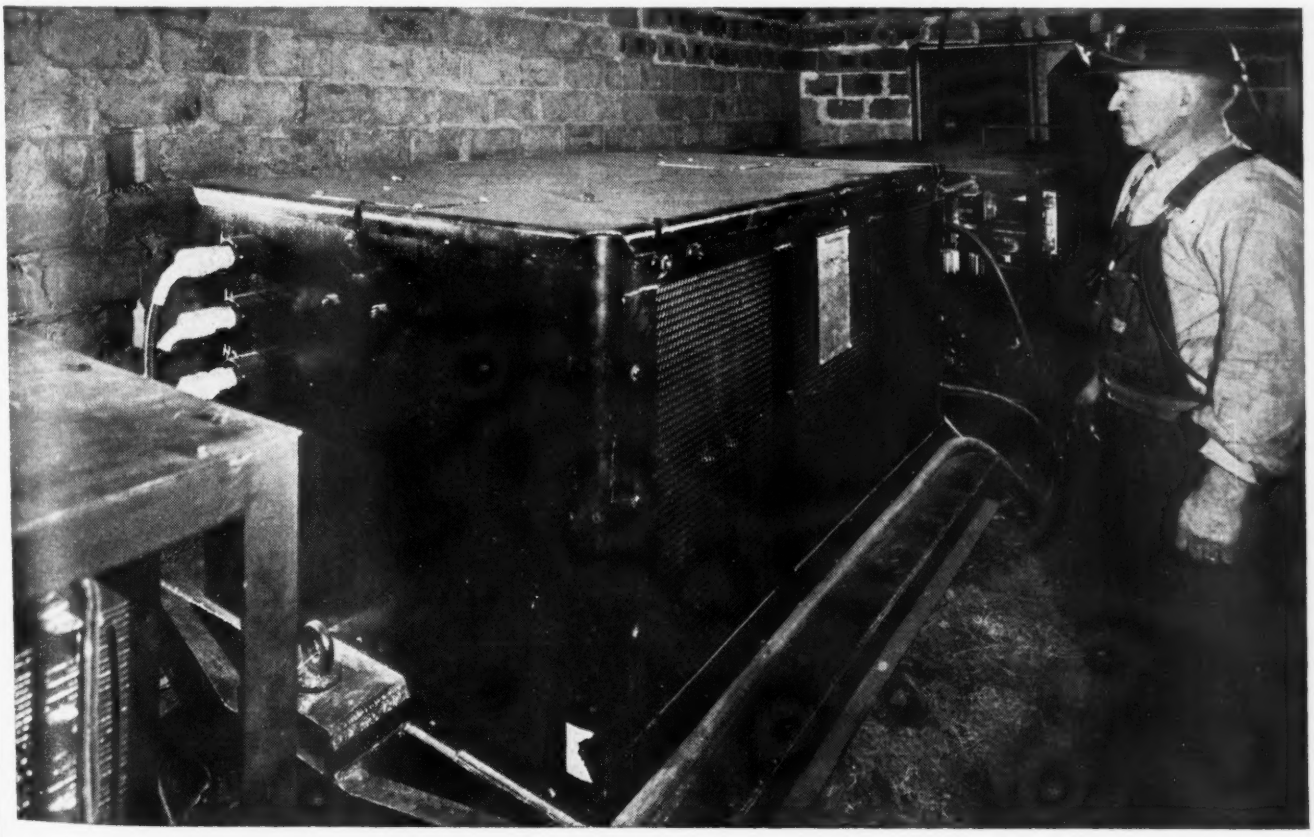
Westinghouse Electric & Mfg. Co.
St. Louis, Mo.

EARLY IN 1942, as a result of increasing demands, a power survey of the Consolidated Coal Co. mines, all in central and southern Illinois, indicated that in three locations the underground distribution systems were fully loaded. It was necessary, therefore, to redesign them for greater capacity and to provide additional a.c. to d.c. conversion equipment. Installation of mercury-arc rectifiers was a major step in the improvement program.

Increased distribution-system demand resulted because every available piece of operating equipment was pressed into service to maintain production at the highest possible level. Rapid advancement of working faces, which increased distance of haul; manpower shortage, and the necessity of performing some operations on-shift that formerly were accomplished off-shift also were factors in increased load demands. Additional a.c. to d.c. conversion equipment, therefore, became necessary for the company's mines at Mt. Olive, Staunton and Nason.

Illinois mines usually employ synchronous motor-generator sets for conversion. Very few rotary converters have been used in the State and no mercury-arc rectifiers had been installed prior to the Consolidated Coal Co. project. Mines of this company also were using synchronous motor-generator sets with the exception of one 200-kw. rotary converter.

Investigation of the Ignitron mercury-arc rectifier disclosed that it had definite advantages. It requires no special foundation, is easily installed and easily moved. It is instantly available for service at the touch of a button, is quiet in operation, and has no starting inrush of current. Although



One of the three 300-kw. rectifier units installed in Consolidated mines, comprising rectifier, transformer and auxiliary cars.

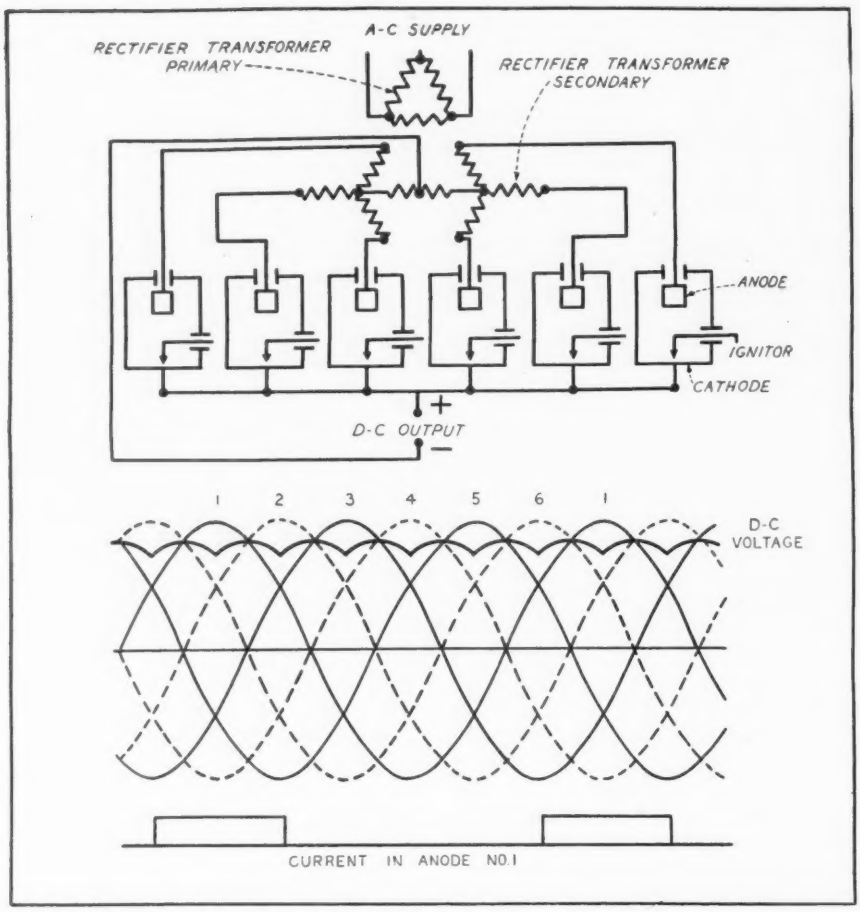


Fig. 1—Schematic wiring diagram of double 3-phase transformer connection employed in Ignitron rectifiers for mines. Drawing also shows d.c. voltage and current wave forms.

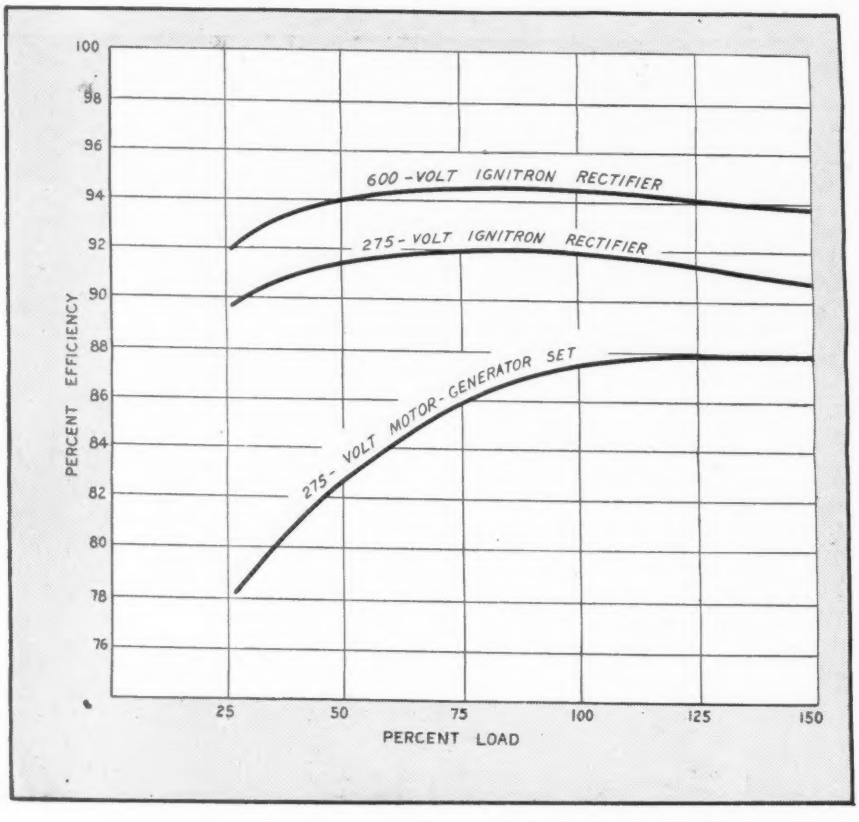


Fig. 2—Efficiency curves for typical motor-generator sets and Ignitron rectifier (data plotted are for 300-kw. units).

the Ignitron rectifier operates at a high power factor (93 percent lagging), it cannot be used for power-factor correction. Furthermore, a cooling system is involved. Comparing the price of an Ignitron rectifier with that of a motor-generator set, the difference is small, provided that the motor-generator set is equipped with switchgear and protective features similar to those supplied with the rectifier. Ignitrons require less critical material and machine-tool work in their construction. Thus, they are available for much earlier delivery than could be obtained on a motor-generator set.

Mine Service Severe

Motor-generator sets and rotary converters, when used in coal mines for underground operations, usually are a source of considerable trouble. Conditions are unfavorable for such rotating equipment in that surrounding air usually is moist and very often dusty. Moisture and dust interfere with good commutation and continuous maintenance is essential to trouble-free operation. Dust and moisture often cause brushes to stick or hang in their holders. Other bad effects include rapid commutator wear, high mica, and flashovers that sometimes damage equipment.

Vibration is another enemy of commutation. In fact, it damages the entire machine. It often develops because of unbalance in some part of the machine and may be very difficult to correct. In any event, winding and commutation trouble seems to increase in direct proportion to intensity of vibration.

Rectifiers Adaptable

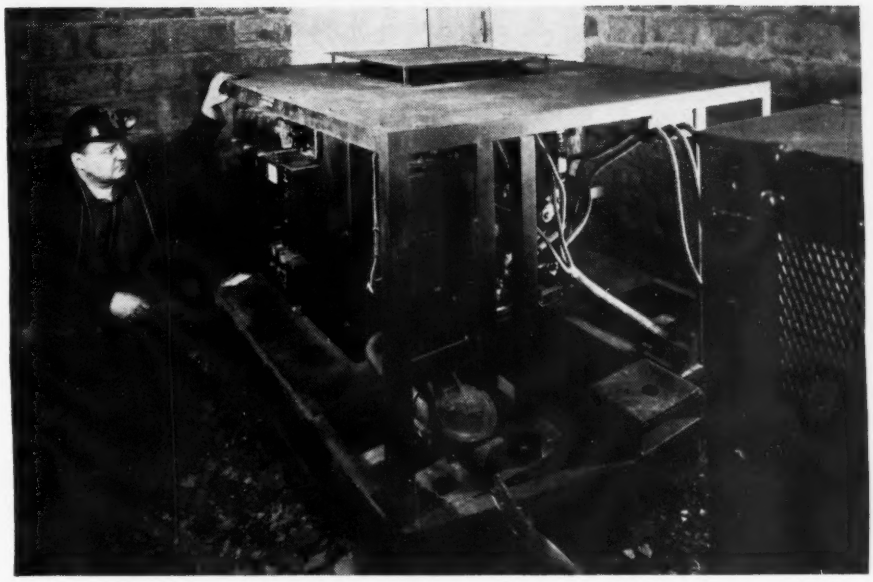
Ignitron rectifiers are particularly adaptable to underground conditions. They are not affected by dust and are free from commutation troubles. Except for a small pump and fan needed for the water-cooling system, there are no rotating or moving parts, leaving the equipment free from vibration with its resulting difficulties.

After Consolidated Coal Co. engineers decided to install Ignitron rectifiers they studied the two types of rectifier tubes: pumped and sealed. Pumped tubes came equipped with a vacuum pump, vacuum gages, mercury heaters and other auxiliaries. Before such units can be placed in operation after a long period of shutdown, vacuum must be restored. Tube life is greater than on the sealed type since repairs can be made after failure. Overload capacity of the pumped tube is greater because foreign gases, which may be liberated during overloads, are

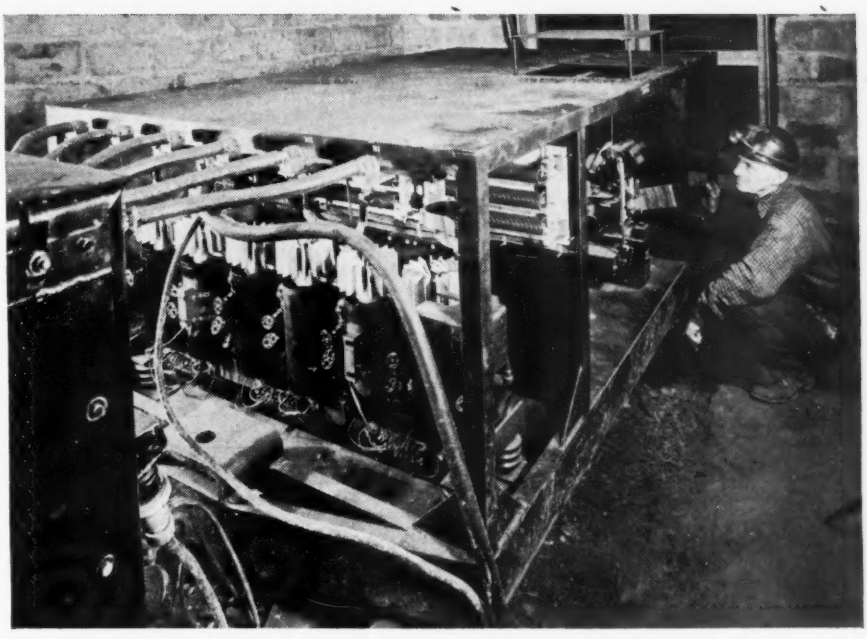
continuously removed by the pumps. In general, pumped-type rectifiers are best suited for applications where high overload conditions exist.

Ignitron rectifiers using sealed-type tubes are simple in operation, have fewer moving parts and can be placed on the line without delay. As mentioned before, overload capacity is less than with the pumped type. Guaranteed operating life of the sealed tube is three years plus a two-year shelf life. Since tube replacement is practically the only maintenance item to be considered and since tubes are guaranteed on a pro rata adjustment basis, maximum maintenance cost is practically fixed. Damages from falls, collisions, fires, water and other causes, of course, are not included as normal maintenance items.

Units installed in Consolidated Coal Co. mines are sealed-tube type. Rated 300 kw. at 275 volts d.c., they operate from a 3-phase 60-cycle 2300-volt supply. The installation consists of six tubes connected as shown in Fig. 1. Tubes are cooled by a closed water system utilizing water-to-air heat exchange. The entire unit is arranged so it may be moved readily—thus service can be established as soon as a.c. power and d.c. load leads are connected.



Author Conway looks over No. 1 car of 300-kw. rectifier unit. This car carries a.c. air breaker, auxiliary transformer, disconnecting fuses and a.c. control panel.



Electrician throws d.c. control switch on Car No. 3 of 300-kw. rectifier unit. This car carries six sealed-type tubes, heat exchanger and control panel.

Three Cars in Unit

To meet mine-shaft dimensional limitations, each rectifier is composed of three individual cars. Equipment is arranged as follows:

CAR NO. 1
- A.c. high-tension air breaker.
- Auxiliary transformer and disconnecting fuses.
- A.c. control panel.

CAR NO. 2
- Double 3-phase air-cooled main power transformer.

CAR NO. 3
- Ignitron rectifier
- Heat exchanger
- D.c. control panel.

Fully automatic, the installation operates unattended. Power for switching and for controls is taken from an auxiliary air-cooled power transformer that steps down from 2,300 to 230 volts, 3-phase. Pressing the "start" button initiates an operating sequence that is fully automatic. The unit goes into service at once, unless the protective devices have functioned to lock it out. The rectifier will shut down temporarily and will restart automatically on clearing the following conditions:

1. Low d.c. voltage.
2. High transformer temperature.
3. Excessive overload.
4. Arc back.

The rectifier will shut down and lock out of service on occurrence of:

1. Four successive arc backs in 60 seconds.
2. Sixteen arc backs between inspections.
3. Failure of cooling system.

Two characteristics of Ignitron rectifier equipment weighed heavily in the final choice: (1) It can handle heavy overloads; (2) output voltage can be readily controlled. Equipment will handle full load continuously, 150 percent for 2 hours and 200 percent for 1 minute. Voltage-control equipment includes a voltage regulator that maintains practically flat d.c. voltage. This is true from full load to light load, even though a.c. voltage varies as much as 12 percent above normal.

The main transformer is equipped with a no-load tap changer having two 2½ percent taps above the two 2½ percent taps below normal (2300) voltage. Fig. 2 graphically compares the efficiencies of a motor-generator and an Ignitron rectifier.

Three Ignitron rectifiers which were purchased and installed by the Consolidated Coal Co. at its Mt. Olive, Staunton and Nason mines are now in full operation. Performance to date has fully justified their selection.

HIGH-STRENGTH STEEL

Makes Light Mine Cars That Stand Abuse

High-Strength Corrosion-Resisting Steels for Mine Cars Provide Definite Advantges in Ability to Withstand Hard Usage With Low Upkeep and Maximum Capacity—Regular Cleaning Worth the Cost

By ***WILLIAM H. H. GINDER JR.***
Development Engineer
Carnegie-Illinois Steel Corp.
Pittsburgh, Pa.

One of the steps in testing steel for ability to perform in service—lining up the cylindrical tup (see text) parallel to the framing prior to the drop test.

IT WOULD be hard to find a piece of equipment in any industry that takes more rough treatment than a coal-mine car. Mechanical loaders hurl rock into a car that is primarily designed for handling coal rather than rock. These same loaders toss lumps of coal weighing over 100 lb. into the cars. Loading booms pound against the car ends. Cutter-bars sometimes are used as motivating devices at the face, as evidenced by perforated car ends. When derailed, methods that often fail to consider damage to the car are used to get the car back on the track. Brakes too often are set and allowed to remain set until the brakes or wheels or both are damaged beyond repair. Car wrecks are not uncommon. Wet coal often is allowed to accumulate in car bottoms too long, causing premature corrosion and shortening the life of the car. A coal-mine car takes a terrific beating!

Coal-company engineers and maintenance men who who have studied this car-abuse problem thoroughly in an effort to eliminate mishandling as much as possible, as well as to determine what type of car would best suit their peculiar operating conditions, have reached, paradoxically, two diametrically opposed conclusions.

A small number of such men sincerely believe that the most economical solution to the haulage problem is to purchase or build low-first-cost wood-bodied cars and maintain extensive repair shops to replace splintered and rotted bodies. They have a more or less fatalistic attitude toward cars, reasoning that, since they will be mistreated or wrecked anyway, it is better to purchase cheap cars that can be repaired easily than to make a higher initial investment in a modern-type steel car. It would be interesting if the annual maintenance costs with this type of equipment could be revealed, since there are many reasons why a higher original investment in a well-designed high-strength steel car should show an over-all saving to coal companies by considerably reducing maintenance costs.

Good Materials Pay

Another somewhat larger group of coal-company engineers and maintenance men compare mine haulage with railroad haulage. While conceding that mine cars will be abused, they believe that most wrecks are preventable by maintaining heavy-railed haulageways with good roadbeds and a minimum of curves and steep grades. They hold that since a car will be abused to a considerable extent, despite the best supervisory efforts, it is imperative to purchase a car made of the best possible materials to withstand such damage as does occur. These operators specify high-strength steel (for example, Cor-Ten) to get maximum strength and corrosion resistance in the bodies and to get maximum capacity for the limiting car dimensions. Brakes, automatic couplers, spring or rubber mountings, anti-friction bearings, and the highest quality rolled-steel, cast-steel or cast-iron wheels also are included in the specifications.

The majority of engineers and maintenance men would like to have all the features mentioned above in their cars, and many have them, but some are inclined to avoid a higher initial investment. The usual tendency, then, is to compromise on first cost by specifying steel bodies (plain steel,

copper steel or high-strength steel), anti-friction bearings, brakes, link-and-pin couplers and cast-iron wheels.

Manufacturers of mine cars, however, are constantly striving to build a foolproof car. Their aim is to build the strongest, toughest, most corrosion-resisting car with maximum carrying capacity for the limiting over-all dimensions specified—at a minimum weight and cost. Most coal companies place their mine-car problems in the hands of the mine-car builders and wisely confine their judgment to selecting the best design submitted by the builders. In some cases, however, despite the mine-car builders' over-all knowledge of mining conditions and mine cars in all phases, they are forced to discard or eliminate design features which they know through experience will best meet conditions in favor of special features insisted upon by the coal-company engineers. This quite frequently results in a compromise design which often is a source of trouble and expense to the purchaser.

High Strength Necessary

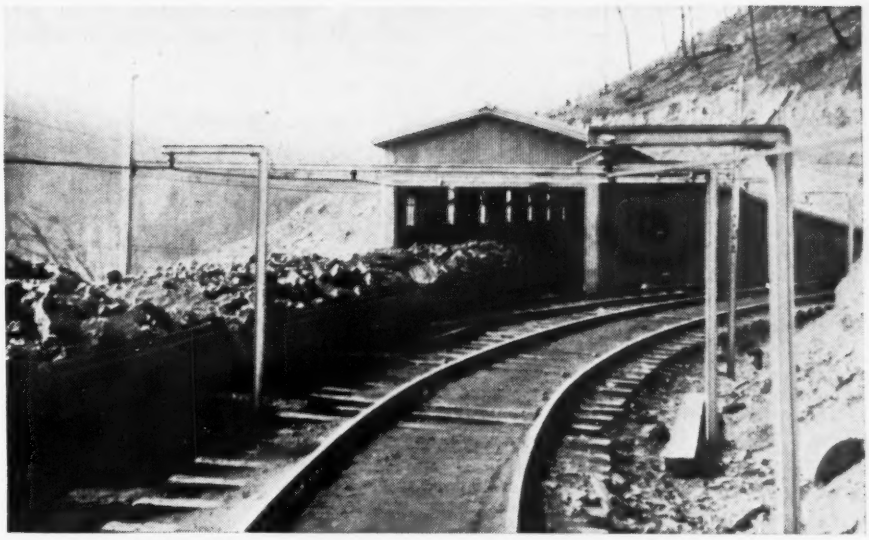
Mine-car builders, without exception, agree that a high-strength steel is required to build a mine-car body with maximum strength, toughness, corrosion resistance and abrasion resistance for a given capacity and with a minimum of dead weight.

Table I compares the properties of a high-strength steel commonly used in mine-car construction and a representative structural steel.

Since mine cars are subject to severe impacts from stone and large lumps of coal, as mentioned previously, the results of a comprehensive test designed to measure the effect of heavy impacts on different steels are of special significance.

To determine the relative performance of Cor-Ten and structural-steel welded structure when subjected to the impact of falling stone, ore, etc., and to the abuse of grab buckets and other unloading devices, heavy weights (or tups) were dropped from several heights on plates of different thicknesses which had been welded to a supporting framework.

The test frames were made up identically except that the high-strength frames had ½-in. Cor-Ten plates welded to Cor-Ten "floors" and longitudinals, while the structural-steel frames consisted of 0.6-in. carbon-steel top plates with carbon-steel "floors" and longitudinals. The structures were exact duplicates of the inner bottom structure of ore boats except that the high-strength plates were 16⅔ percent lighter than the carbon steel normally used.



1,025 high-strength steel cars of this design saved 308 tons of excess weight, equivalent to the weight of 162 cars.

Two different types of tups were dropped from heights of 6 to 35 ft. on all structures, and measurements of deformation were taken after each drop. A cylindrical tup 53 in. long and 17 in. diameter, weighing 3,500 lb., gave a line contact simulating the line impact of a Hulett unloader, clamshell bucket or similar object, such as a piece of rock or coal falling into a mine car flatwise. Another tup, weighing 525 lb. with a hemispherical end, simulated the point of contact resulting from the falling of pig iron, limestone or similar object, such as a piece of rock or coal falling endwise into a mine car.

Calculations were made from the measurements of distortion after each drop. These showed that on line impacts between the supporting frames the energy-absorbing power of the high-strength structure was three times as great as that of the thicker carbon-steel structure up to the yield point of the material. The drop tests showed further that the ability of Cor-Ten steel to resist damage from line impact, within the limits of these tests, was at least 10 percent greater than that of the carbon steel even when the high-strength steel was 16⅔ percent thinner than carbon steel.

Under line impact transverse to the supporting frames, involving both the plating and the framing, at similar stresses the Cor-Ten structure was twice as resistant to line impact as a carbon-steel structure of 20 percent greater plate thickness. Even with plating thicknesses 16⅔ percent less than that of carbon steel, the ability of the high-strength steel structure to resist damage was 35 percent more than that of the thicker carbon-steel structure. The point impact tests further demonstarted that the high-strength structures offered greater resistance to damage than did the 20 percent thicker carbon-steel structures.

These tests are indicative of the performance of the different materials under impacts such as are encountered in mine-car service.

TABLE I—HOW HIGH-STRENGTH AND STRUCTURAL STEEL FOR CARS COMPARE

	High-Strength Steel (Cor-Ten)	Structural Steel for Cars A.S.T.M.–A–113)
Tensile strength.....	70,000 lb. per sq. in. min....	50,000–65,000 lb. per sq. in.
Yield point.....	50,000 lb. per sq. in. min....	1/2 Tensile strength min.
Abrasion resistance...	1.33 times that of structural steel	
Atmospheric corrosion resistance.....	Approximately 4 to 6 times that of structural steel	

Because of their better mechanical properties, in addition to their resistance to corrosion and abrasion, it is possible to obtain maximum economy through the use of high-strength steel in mine cars. Several case histories

supplied by mine-car companies illustrate this point:

One mine-car company recently designed a high-strength steel car weighing 6,000 lb. with a capacity of 232 cu.ft. to replace plain-steel cars weighing 4,500 lb. with a capacity of 135 cu.ft. Two hundred high-strength steel cars were required instead of 344 cars to haul the same tonnage of coal. In addition to saving 130 tons of dead weight the coal company was able to save the initial cost and repair costs on 144 cars.

Another coal company wanted to replace 1,100 old-style wood cars. It was indicated that 1,000 plain-steel cars would be required. A high-strength steel design made it possible to replace the 1,100 wood cars with 800 cars, saving 490 tons of weight and the initial and maintenance costs on 300 cars.

A third coal company purchased 1,025 high-strength steel cars with a weight saving of 308 tons, equivalent to the weight of 162 cars of plain-steel construction.

Weight saving offers these economies: (1) more cars per trip; (2) more pay-load per trip; (3) lower power cost; (4) longer wheel and rail life. Some engineers believe that these combined savings are sufficient to justify a regular car-replacement program.

How Weight Is Cut

Most of the weight saving in modern cars now in service was accomplished by designing the cars with $\frac{3}{16}$-in. high-strength steel sides and ends and $\frac{1}{4}$-in. high-strength steel bottoms, instead of $\frac{1}{4}$-in. plain steel sides and ends and $\frac{5}{16}$-in. bottoms. The lighter high-strength steel cars have greater strength than the heavier cars and service records reveal that these light-weight cars stand up.

Three-sixteenths inch probably is the minimum thickness for sides of cars for average service. In a test to determine the minimum thickness of high-strength steel sides, some cars were built with $\frac{1}{8}$-in. sides. It was found that the car sides were satisfactory from a corrosion-resisting standpoint but that structurally the cars were somewhat too light for normal operations.

Some of the increased capacity in cars now in service was obtained by replacing wood with $\frac{3}{16}$-in. high-strength steel sides. An example of increased capacity by direct substitution of high-strength steel for wood follows:

A mine-car body with outside dimensions 12 ft. long by 6 ft. 6 in. wide by 2 ft. 2 in. high, built of $1\frac{1}{2}$-in. wood, has a capacity of 159.1 cu.ft. The same size body built with $\frac{3}{16}$-in. high-strength steel has a capacity of 167.8 cu.ft., or an increase of 5.5 percent in capacity. The high-strength steel car body will be somewhat lighter than the wood body.

In actual practice, when steel cars replace wood cars they usually are redesigned completely, thus effecting much greater capacity, inasmuch as steel can be fabricated to designs that are impossible with wood.

Local conditions sometimes dictate a car designed especially to give the longest possible life rather than one designed primarily for weight saving. This is especially true where operators work under wet conditions, with high-sulphur coal or abnormal quantities of rock, which represent severe service. They prefer to substitute high-strength steel for plain carbon steel, thickness for thickness, to obtain additional strength and corrosion resistance with the ultimate aim of substantially increasing the life of their cars.

Cleaning Essential

All the benefits that can be derived from the effort and thought put into designing a car to gain maximum capacity, minimum dead weight and corrosion-resistance are lost when wet coal is allowed to accumulate on the bottoms and sides of the cars. Cars with pockets and corners designed to provide maximum capacity and strength are not necessarily self-cleaning and fines may build up into a wet mass in and near such points. If this accumulation is not removed at frequent intervals, contact and acidic corrosion will take place on the plates. Furthermore, permitting this mass to build up reduces the capacity of the car. One operator figured he had been losing about 800 lb. of capacity per car before he began cleaning at regular intervals. In this instance, the loss per day with the number of cars involved was equivalent to the capacity of 40 cars. Cars, therefore, should be cleaned regularly when pockets and crannies prevent self-cleaning. A car entirely free from pockets and crannies, of course, is the most desirable when sufficient strength can be developed to meet service requirements.

An extensive study[1] of the corrosion of steel hopper cars by coal revealed that such corrosion depends largely on the kind of coal and how long wet coal is allowed to remain in the cars. "Long storage permits two corrosion mechanisms to act on metal parts: (1) attack by leachings which contain appreciable quantities of ferric sulphate, and (2) corrosion set up by the constant physical contact of particles of wet coal against the metal sides and bottoms.

"In normal coal-car service, the interval between exposure to coal permits the formation of a rust film which serves as a partial protection against the action of the leachings. When cars are loaded and emptied frequently, contact corrosion is distributed more uniformly over the plates and does not cause such severe local pitting as occurs when wet coal remains stationary in a car for a long period."

Tests showed that leachings from wet coal of moderately high sulphur content do not become severely destructive until the coal has been stored from four to six weeks. These leachings will shorten the life of any car material whether it be wood, steel, high-strength steel or non-ferrous metals. In fact, all construction materials except glass and rubber are adversely affected.

Many methods are being used to clean cars. Water sprays, compressed air, jackhammers and manual cleaning are used effectively. Unless carefully supervised, the jackhammer method may knock any protective scale off the steel, as well as set up stresses in the hammered parts that actually may accelerate corrosion. In addition, the hammering may loosen welds and rivets. The other methods are quite satisfactory. It has been demonstrated that the additional equipment and labor costs involved in cleaning cars are more than offset by increased pay-load capacity and longer car life.

Corrosion Resistance Too

High-strength steels are furnished to minimum physical properties of 50,000 lb. per square inch yield point and 70,000 lb. per square inch tensile strength in the thicknesses commonly used in mine-car construction. They were developed some ten years ago primarily for railroads seeking a high-strength steel that did not have to be heat-treated and could be welded and fabricated by ordinary methods, to reduce the weight of their cars at a minimum cost. The steel, of course, had to have more corrosion resistance so that the lighter gages used in effecting weight reduction would not result in shorter car life.

Since the introduction of this high-strength steel, 52,000 railroad cars and more than 10,000 coal-mine cars have been built, using this material. The experience of railroad and coal operators with high-strength steel equipment confirms the assertion that these steels can be designed to offer maximum capacity and maximum strength at a minimum of dead weight for given over-all dimensions at very little increase in first cost.

[1] Schramm, Taylerson and Larrabee, *Railway Age*, Nov. 28, 1936.

TWO-LEVEL HOISTING

Task of Anthracite's Biggest Electric Unit

New 1,750-Hp. Cylindro-Conical Hoist Replaces Old 30-x60 Steam Unit at No. 7 Shaft, Coaldale Colliery—Will Serve Four Levels Eventually—Special Design Features Facilitate Fast Operation

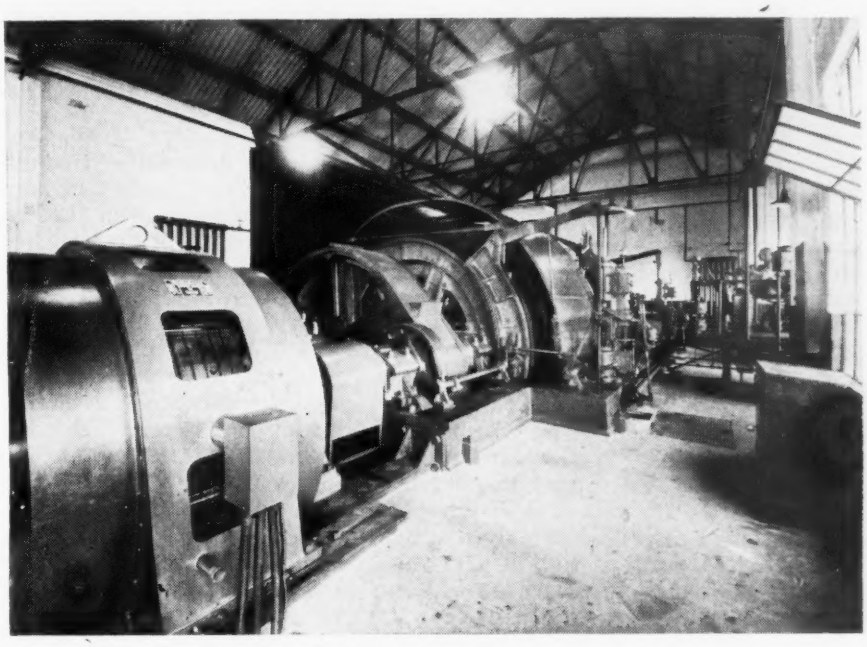
ANTHRACITE'S most powerful electric hoist made its debut March 24 before the chiefs of the Lehigh Navigation Coal Co., the Pennsylvania Power & Light Company, the Vulcan Iron Works and the Westinghouse Electric & Manufacturing Co. It takes the place, at No. 7 shaft of No. 8 Colliery, Coaldale, Pa., of an old Vulcan steam hoist of the vintage of 1906.

The old steam unit was a 30x60-in. hoisting engine with 10-ft. drums and steam-operated hand brakes. Rope speed at full load was 3,000 f.p.m. With the passing of this veteran, electricity entirely replaces steam for power requirements at all Lehigh Navigation collieries, except for one large air compressor, the days of which also are numbered.

The new Vulcan electric hoist has two cast-iron cylindro-conical drums, 9 to 15 ft. in diameter. One drum is fixed to the shaft and the other is provided with a positive tooth-type clutch to facilitate hoisting from more than one level. The brake ring is constructed of nickel-alloy cast iron, so that it will resist both abrasion and the high temperatures resulting from the application of brakes. Drum spiders are of 0.30 carbon cast steel. Each of these drums, complete with spiders, weighs 63,000 lb.

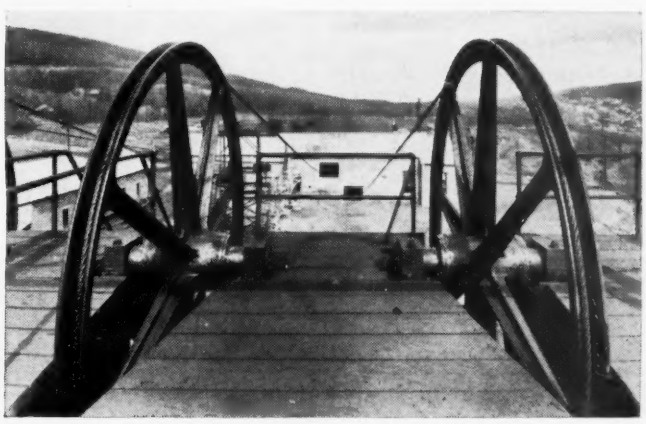
The hoist is driven by a Westinghouse three-bearing 1,750-hp. 40-deg. C., continuous-rating, 492-r.p.m. induction motor energized by 2,200-volt, three-phase 25-cycle current. It is of open-type construction. Provision is made so that the stator of the motor can be shifted on the bed plate to facilitate repair of either stator or rotor. The rotor potential rating is 1,180 volts and the rotor current 673 amp.

Because Lehigh Navigation takes power for all its collieries from a cen-

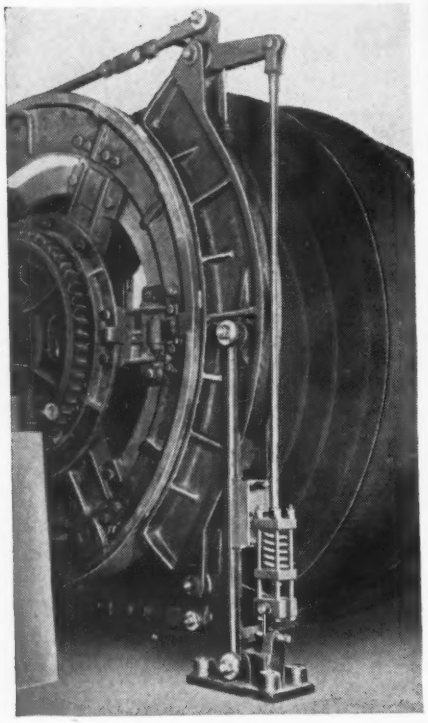


A 1,750-hp. induction motor powers the new hoist.

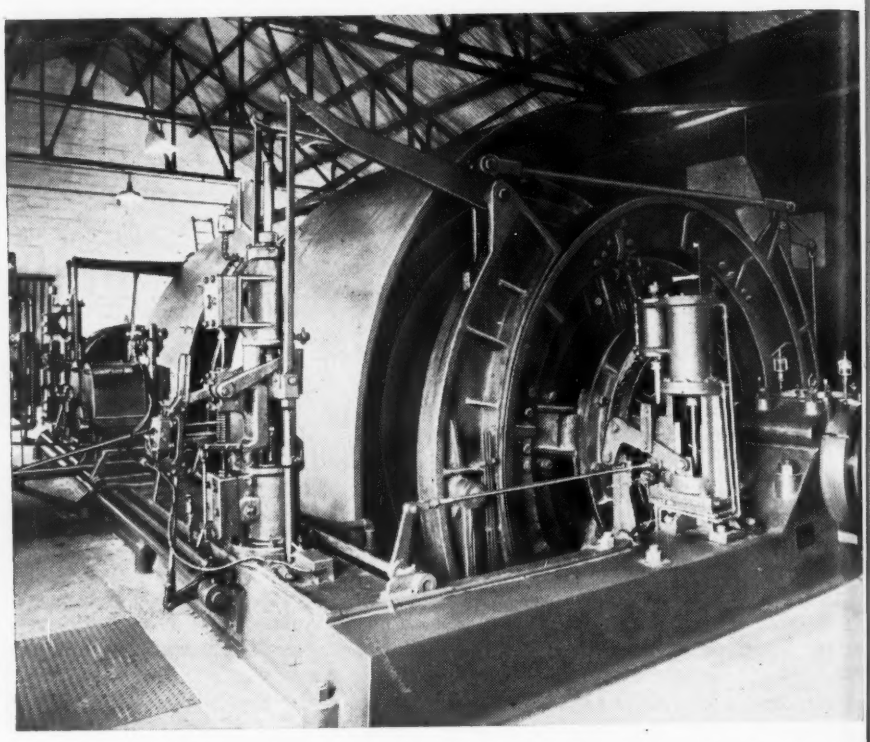
"Bob" Hobart, L.N.C. mechanical superintendent, tries the controls of anthracite's biggest hoist.



Looking down through the sheaves to the new hoist house. Fleet angle is 58 min.



Special pressure-graduating rig smooths brake operation.



An air-operated clutch engine and positive tooth-type clutch permit changing the hoist for lifting from different levels.

tral metering point, the power demand for this hoist will be a relatively moderate drain on the entire block of energy being used at any time. Use of an induction hoist presented large economies in first cost and saved a large expenditure for equipment that otherwise would have been needed to convert alternating to direct current and to provide Ward Leonard control. The duty was calculated to permit unbalanced hoisting of coal when desired, but actual test proved that it was possible also to hoist rock in the same manner, despite its greater weight. No. 7 shaft is vertical, and hoisting almost invariably will be in balance, but it was thought well to have leeway for unbalanced hoisting.

All the colliery machinery is run by 25-cycle current, a frequency which gives perfect satisfaction for handling industrial loads but causes too much flickering for comfort when used for domestic lighting.

Primary hoist control is furnished by electro-pneumatically operated contactors, and secondary control gives 10-point acceleration through adjustable relays of the definite time-limit inductive type operating on the last seven contactors which are actuated at 250 volt, d.c. The first three points are under manual control. The clutch operation has a safety interlock, which automatically applies the brake on the loose drum during disengagement or engagement of clutch. An electro-pneumatically operated air-brake contactor provides for reversal on the 2,200-volt circuit.

The parallel-motion post-type brakes with pressure-graduating rigs permit initial clearance between brake shoe and drum without danger of dragging and assure smoother, more uniform braking action than would otherwise be possible. In the event of overwinding, overspeeding, power failure or of mistakes of any kind made by the hoisting engineer, the hoist is arranged to stop promptly yet smoothly and cannot be restarted until normal operating conditions have been reestablished.

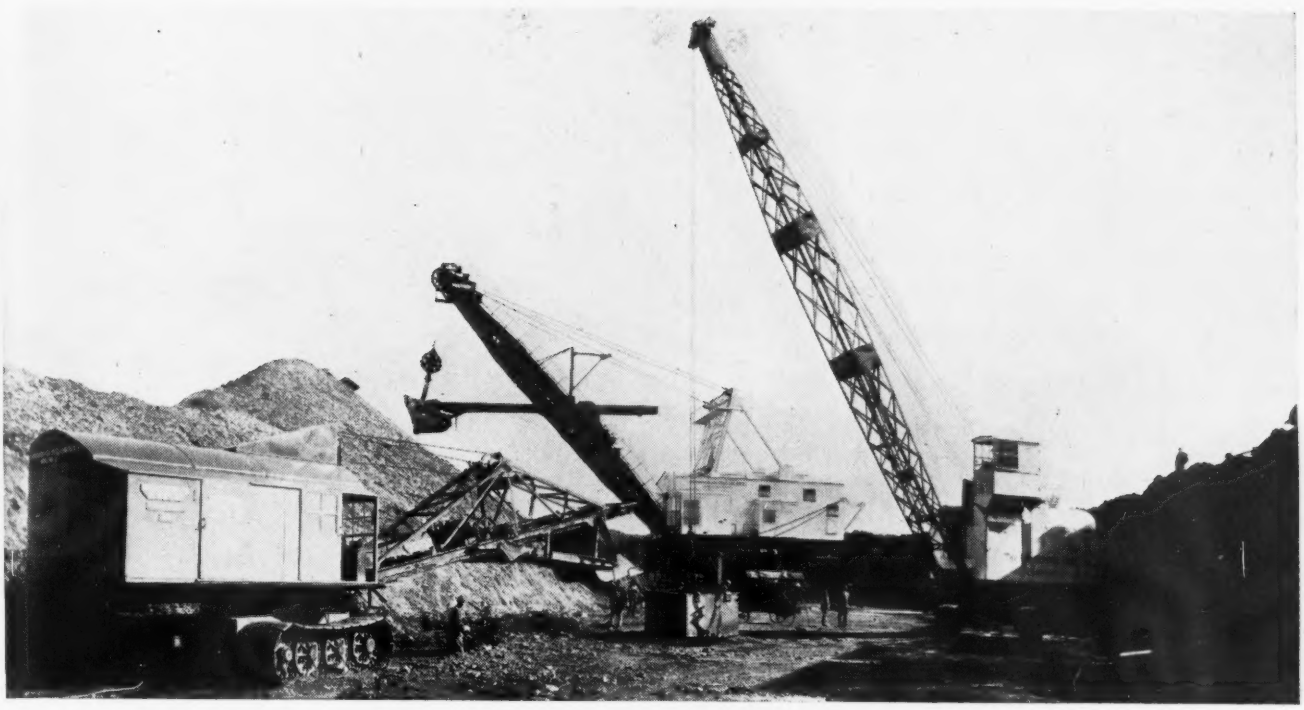
Weight of cage is 11,000 lb., of empty car 5,500 lb.; of coal in car 9,000 lb., and of rock in car 11,000 lb. Cars are hoisted on a platform cage, and the cars are caged and decaged by gravity. Rope diameter is $1\frac{5}{8}$ in., and rope weight per foot 4.2 lb. The fleet angle is 58 min. This is well below the 1 deg. 30 min. which is regarded as the upper limit for this angle. These Vulcan "Allcasteel" sheaves have Timken tapered roller bearings. Pitch diameter is 12 ft. Men and material will be hoisted by this equipment.

Plans are made for hoisting eventually from four levels; not, of course, in the same stage of development, but through the life of the mine. At present the hoist will lift coal from the 7th level at a depth of 902 ft. and from the 8th level at a depth of 1,116 ft. In the future, it will lift from a 9th level with a depth of 1,341 ft. and from a 10th level with a lift of 1,566 ft. This lowest level will be about 50 ft. above the bottom of the basin at this point. Hoisting speed is 3,020 f.p.m. Accelerating and decelerating times in all four instances are arranged to be 10 seconds each and caging time allowed is 8 seconds, or a total of 28 seconds. Therefore, the several duties of the hoist can be calculated to be as in the table.

J. B. Warriner is president of the Lehigh Navigation Coal Co., Inc.; Evan Evans, vice president and general manager; R. E. Hobart, mechanical superintendent; and W. E. Connor, his assistant.

HOIST PERFORMANCE IN LIFTING COAL OR ROCK FROM THE SEVERAL MINE LEVELS

Level	Trips per Hour	Full-Speed Time, Seconds	Other Time, Seconds	Total Time of Cycle, Seconds
7th	93.0	10.7	28	38.7
8th	78.5	17.8	28	45.8
9th	69.5	23.8	28	51.8
10th	60.8	31.3	28	59.3



Horizontal thrust loader filling into a drop-bottom skip at a Kansas mine. The crane at the right lifts the skip to rail cars on the high wall. To reduce dead weight, skips have been made of aluminum alloy.

LOADING STRIP COAL

For High Efficiency at Minimum Cost

Modern Drilling Equipment Facilitates Coal Breaking—Pinning Machines Used in Thin Coal in Some Fields—Shovel and Dipper Improvements Make for Faster Loading and Cleaner Coal Output

By ***FRED W. RICHART***
Assistant Editor, Coal Age

Coal Age
CONTRIBUTION TO
LOWER MINING COSTS

STRIP PIT loading of coal, beginning with the hand shovel and now grown to the 7½-cu.yd. super-robot, might be thought of as a humdrum job, with little expectation of new developments leading to cleaner raw coal or more tonnage. But such is not the case, since even plain coal loading is on the list of things subject to improvement through new equipment and new methods.

With the overburden removed and the coal surface cleaned the coal occasionally is soft enough to be dug right out of the seam. However, that is not general and the necessary preparatory work involves numerous practices.

Before the day of the coal washer, the stripper and its bulldozer were followed by hand shovel, broom and even compressed air to remove the last vestige of slate and dirt, so the coal surface might be clean. With the advent of the washer as an almost universal method of processing strip coal, and with its ability to reject practically all free impurities, some of the refinements of surface cleaning have been abandoned, although there still are exceptions.

Another sort of impurity exists in some coal veins in the form of "horse backs." These long streaks of clay are injected vertically into the vein, often apparently from below, where the base of the horse back may be several times as wide as at the coal surface. These may be plowed out with a bulldozer as far as possible and then worked around with the loader.

It is the practice in most pits to break up the coal only just ahead of

the loader so that traffic will not further pulverize the broken pieces. Some mines do a final job of surface cleaning just ahead of the loading shovel. They admit this practice may cause quite a loss of fine coal that is pushed off into the gob.

Two methods of breaking up the coal for the loader are in fashion. The usual method is drilling and shooting. The other method was originated to fit the conditions around Pittsburg, Kan., and also is employed in Oklahoma. Known as pinning, it is used only in very thin veins.

Truck Carries Drills

Drilling for the first method is with air drills or vertical motor-driven augers. The air drill is used singly by hand and singly or in multiple mounted on trucks. One mine has an elaborate layout consisting of a discarded truck chassis on which the engine has been replaced by an electric motor. A motor-driven air compressor large enough to operate two air drills is mounted on the truck. At the rear, two drills are mounted on radial arms so that each drill may be swung into position to drill two holes at each truck stop. Flood lamps are mounted above for night work. This drill rig makes as many as 700 holes, 1½ in. in diameter, in a shift in 4-ft. coal. Modification of this type of drill assembly will soon be operating at other strip mines.

Hand-operated air drills do double duty in several mines. In addition to making holes in the coal, boulders and scattered thin layers of limestone are drilled for blasting. This method is used in pits stripped with small draglines and seems to give satisfaction.

The second method of drilling coal is with vertical motor-driven auger drills, usually mounted on rubber tires for easy moving by hand. They are more economical of power than air drills. They fit the job in many strip pits and are so popular that several manufacturers build them. The holes are drilled at 5- or 6-ft. intervals, or even farther apart, depending upon conditions.

Shooting is done with a small stick of explosive (or a half stick). The shots are light to prevent pulverizing the coal. There are mines where the holes are "sprung," after which a charge of powder is used to break up the coal.

Shooting thin coal merely blows pot holes in it, as a rule, leaving the coal solid. The pinning machine was developed to break up thin coal where shooting is a failure, and normally is confined to veins under 18 in. in thickness, where it has proved very successful. Its use being limited, there is no set design and all pinning machines so far are tailor-made.

Tractor-powered sweepers facilitate cleaning the top of the coal at a number of strip operations.

The machine is built on a caterpillar tractor, which carries a piledriver-type rigging on the front. Essentially, it is a heavy weight to the bottom of which is attached a tapered steel pin 2 or 3 in. in diameter. Guides keep the weight in place, and a continuously operating chain carrying lugs at two points lifts the weight and releases it when it reaches the top of its travel. A single stroke breaks the coal.

How Pinning Works

In operation, as soon as the pin is lifted clear of the coal, the operator moves forward to the next position, waits for the weight to fall and then repeats. The process is continuous, the machine making, say, 15 strokes a minute. The number of strokes varies considerably with the design of the machine. The holes are 30 to 48 in. apart as a general rule and the rows are 3 or 4 ft. apart. In the event it is necessary for the loader to dig in on the coal surface, the pinning is much closer so that the dipper can break through readily.

In assembling the pinning machine the caterpillar engine is removed to a new location. Shafting, gears and clutches are arranged to drive the caterpillar and raise the weight. The lifting chains run continuously. Forward movement is hand-controlled.

Even in 3- or 4-ft. coal there is some difficulty in making a standard loading shovel do a good job of getting all the coal without taking some clay. Among the steps toward improvement in that direction are specially designed dippers and "knee-action" front ends for shovels, all tending to promote filling in thin coal and a clean separation of coal from the fireclay.

Several recent improvements to standard loading equipment speed operation, promote convenience, reduce maintenance and increase safety. These items may not all appear in current designs but probably most of them can be had. The addition of cutting teeth to the side of the dipper keeps the side of the cut squared up. Rubber bumpers on the back of the dipper door reduce slam and maintenance. Air-operated friction clutches for driving the "cats" permit the runner to control travel and steering by pushbutton control without the help of a ground man. The inclosure of gears, now fairly universal, was a needed safety measure, retains lubricant and prolongs gear life.

Many loader cabs are so congested with machinery that maintenance men are delayed in their work. The movement to modify that situation has been in two directions—larger cabs and smaller equipment. To the latter end at least three steps are possible or already have been taken: use of 3-phase transformers as a substitute for three single-phase units; shortening the m.g. set by compressing two d.c. generator sets into one; and using higher speed m.g. sets.

With the trend to larger loading shovels for more tonnage and the

Web-stiffened 7½-cu.yd. loading dipper with shearing teeth on the sides. The web originally had a round hole in it but lumps caught in it and interfered with discharging the coal. Now, the back part of the web has been removed and the front edge stiffened by welding a bar to it. Note the sharp teeth for cleaving the coal from the clay.

An example of the pinning machines used in this vein in the Southwest for breaking the coal ahead of the loader.

effort to reduce impurities delivered to the preparation plant, improvements in shovels and modification of methods are getting attention.

The Kansas thin-vein coal field developed its own type of loader years ago. The foundation is a standard loader from which the boom has been removed. The dipper stick also is eliminated and a "horizontal-thrust" dipper is attached to the underside of a different type of boom. This new type boom is attached in a similar manner to the regular boom but is hinged to swing in a vertical plane with the discharge of each dipperful of coal.

The dipper is mounted on a track attached to the underside of the boom and is shifted to and fro by motor-driven pinions engaging in racks on either side of the dipper. The dipper is thrust forward in a horizontal straight line to fill it with coal. The boom then is lifted up, the loader swings and the dipper is discharged. Control is similar to that of the standard loader, for there are three motions; hoist, swing and thrust.

Thrust-Loader Reasons

There are two reasons for horizontal thrust loaders, both based on the thinness of Kansas coal. The travel of a large dipper has to be far in order to fill it with coal, simply because a 15-in. vein of coal fills slowly. The second is that a standard loader dipper travels in an arc and consequently it is difficult for it to make a long stroke and a clean separation of coal from the clay. The horizontal-thrust dipper travels in a straight line, as much as 15 ft., and makes a clean separation. The fact that the coal is thin makes it the more necessary that impurities be excluded. It is a matter of washery capacity and results.

Coal loading in cars and trucks is not confined to the several types of shovels mentioned. Draglines are used too. Many small mines strip and load with the same shovel and dragline. The dragline is used for both operations in the Pennsylvania anthracite and Kansas and other fields, working from the high wall.

An interesting problem in helping an under-capacity coal washer has been solved by loading "clean" and "dirty" coal in the pit. The shovel runner indicates to the truck driver if his load is clean or dirty. A combined field tipple and transfer station has two raw-coal bins. The driver dumps into one or the other, according to the instruction he received from the shovel runner. The clean coal is sized and shipped direct from the field tipple. The dirty coal is sent by rail to the washer. In that way the output of the washery is held to capacity (*Coal Age*, July, 1943).

Still another variation in loading practice is the custom at several Kansas mines. Coal is loaded into skips of about 8-ton capacity and hoisted by crane to a train of rail cars standing on the bank. The crane operates from the coal level in the pit. It is built on a small shovel chassis, has a long boom standing at a steep angle and moves along the pit with the loader.

Yet another method of loading comes from Oklahoma. This also is in thin-vein coal. It is based on a modified Joy underground loading machine. Since the Joy loader normally is built on caterpillars, the only change needed was a rear conveyor long and high enough to reach the type of transport used.

Regardless of the form of the loading unit, it is one of the limiting factors in the production line. Other machines in the line being of comparable capacity, it must be kept busy. One operator stresses its importance by issuing orders that it be kept moving; that no matter where or for what reason haulage trucks are allowed to bunch up, there must always be an empty ready to be filled when a load moves out. His ideal for truck positions in the pit is to have one waiting at the loader while one is being filled. The same principle is observed where rail haulage is used.

REFUSE PICKING

Made Easy and Preparation Improved

Redesign of Picking Facilities for Coal 3 In. and Larger Makes Refuse Removal Easy, Increases Stoker-Coal Tonnage and Reduces Muscular Effort at Franklin County Coal's No. 7 Mine Operation

IN COAL preparation the Franklin County Coal Corp. has demonstrated at its No. 7 Mine, Royalton, Ill., that three desirable objectives may be accomplished at one stroke: clean lump and egg coal, increased production of stoker sizes and easy refuse picking. The general principles involved are: removal of all the coal that has even a suspicion of containing impurities, arrangement of the picking tables so that no energy is lost lifting the refuse; and lighting of the tables with mercury vapor lamps to help distinguish the impurities.

This installation handles two sizes of coal from the main shaker screen: egg and lump. The flow of egg coal is split and delivered to two shaking picking tables with an inclination of 1 in. per foot. These tables extend 26 ft. from the main screen at right angles, and are 54 in. wide. The first 20 ft. is a smooth steel plate with 3½ in. of each edge turned up on an angle so the outer edge is 2 in. above the flat surface. This retains the coal but offers little resistance to raking the refuse over the edge. A steel trough is riveted to each side of the table with the same slope to catch and convey the refuse to a cross-conveyor underneath.

At the lower end of this solid sheet is 20 in. of perforated plate (3-in. holes) to screen out the degradation, followed by a 38-in. slate picker. The latter is made up of eight 3-in. angles laid with the sharp corner up. These angles are separated about 1 in. to allow the flat pieces of slate to fall through on edge.

How Picking Is Done

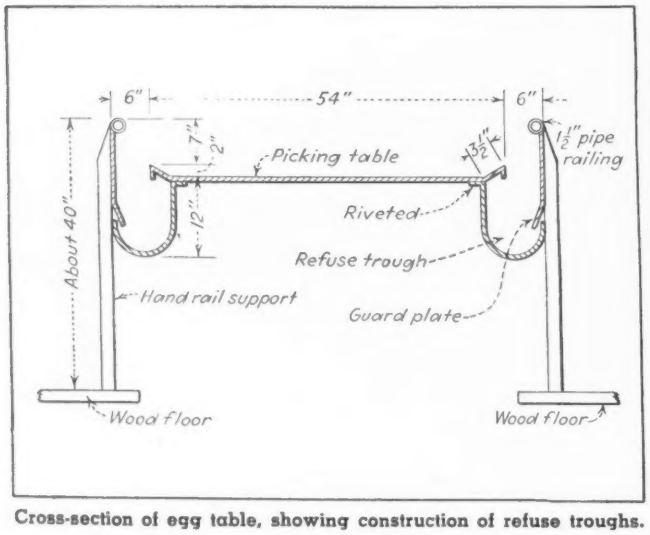
In operation, three pickers on a side of each egg table rake off the refuse and suspicious coal, which falls into the trough and is discharged into the refuse conveyor. Degradation and flat pieces of slate also fall through into the refuse conveyor. Pickers stand on a board walk in the aisles between the tables, which are a convenient height for working. They are protected against falling onto the shaking table by a strong pipe handrail and a steel apron attached to vertical supports.

The lump picking table is quite different in arrangement. It is a horizontal flat-apron conveyor similar to a loading boom. It is 60 in. wide and the working area extends 24 ft. from the discharge end of the shaking screen. This conveyor is between two level steel platforms, each approximately 78 in. wide, with manholes at convenient points for men to stand in. These two platforms serve as storage space for accumulation of refuse and for working space for men with sledge hammers who break up the lumps so that the refuse will fall through a double row of holes to the conveyor underneath. This double row of holes is near the center of each platform flanking the picking table. The holes are about 9 in. square. The two refuse conveyors under these tables discharge into the cross conveyor that serves all the tables.

In operation, four pickers on each side of the moving picking table slide the refuse off and push it behind them onto the stationary tables or platforms. Three breakers on a side break up the lumps and see that all discarded coal and refuse falls through the grating.

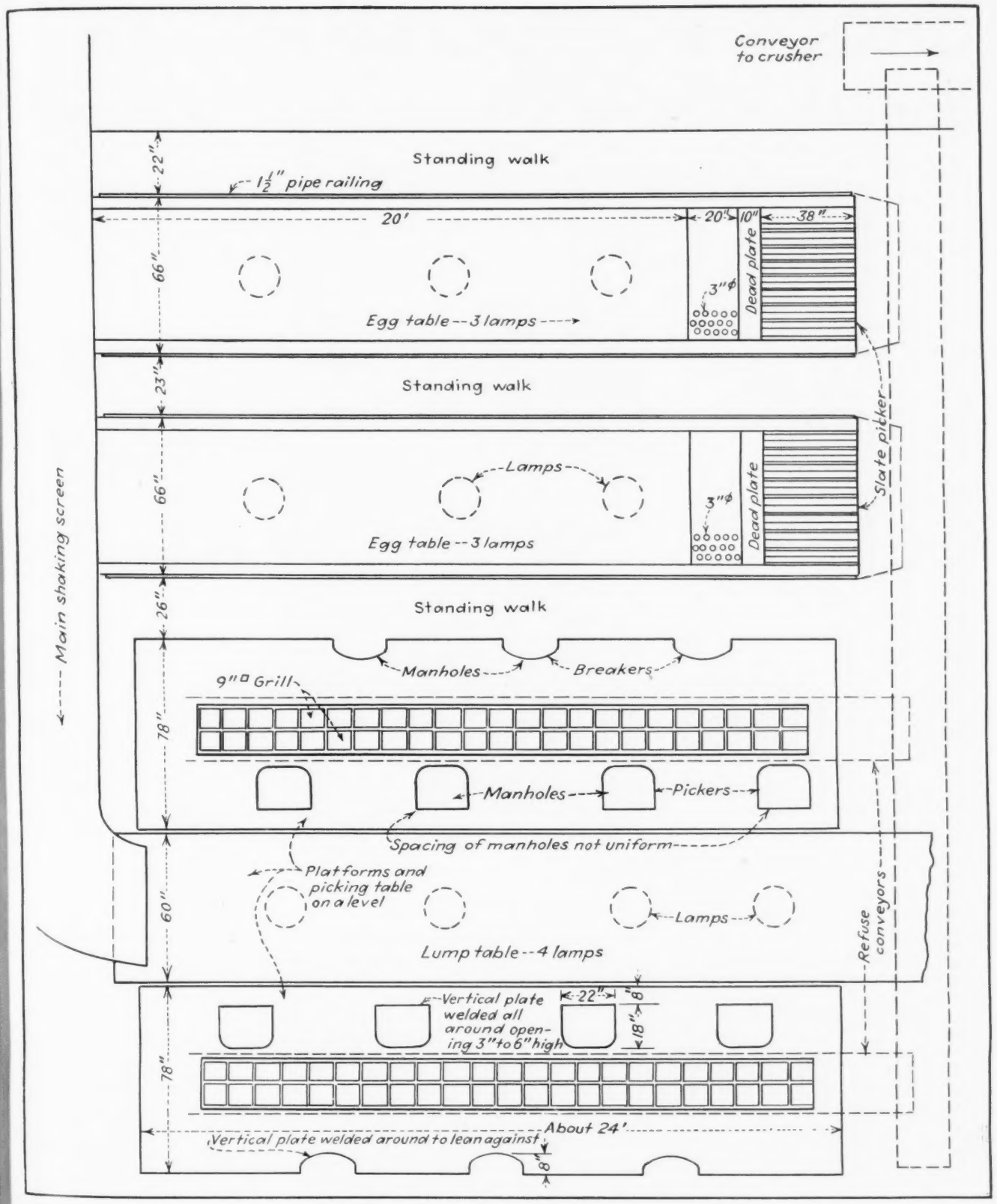
The rejects from all tables are carried by the cross conveyor to another conveyor which elevates it into a ring crusher. The crushed coal is then conveyed to the washery for processing.

Each picking table is lighted with three or four 250-watt mercury vapor lamps under individual reflectors pro-



Cross-section of egg table, showing construction of refuse troughs.

Lump table in operation, showing general layout and method of sliding refuse off the table and breaking up the large pieces, which are placed conveniently for the breakers.



Plan of complete picking-table layout.

tected by glass lenses. With this arrangement the dust may be removed without danger of damaging the lamp. The light from these lamps has the quality of increasing the visibility of streaks and patches of refuse, whether free or in a lump of coal.

About 5,500 tons of coal is hoisted in the single-shift operation. The setup just described takes care of all coal 3 in. and larger with a minimum of effort on the part of the workmen. The height of the tables is about 32 in. for convenience and minimum effort.

This arrangement is a refinement of an earlier design. It was planned to handle increasing tonnage, to assure clean lump and egg sizes and to increase the proportion of stoker coal. The plan originated with the mechanical department of the mine. The equipment was furnished by Link-Belt.

CHOOSING TRANSFORMERS
For Efficiency and Safety in Coal Mining

Fire Hazard Militates Against the Oil-Filled Transformer Underground —Dry-Type Equipment Requires Good Conditions—New Non-Inflammable Non-Explosive Liquids Result in Safe All-Round Unit

By *J. T. BAILEY*
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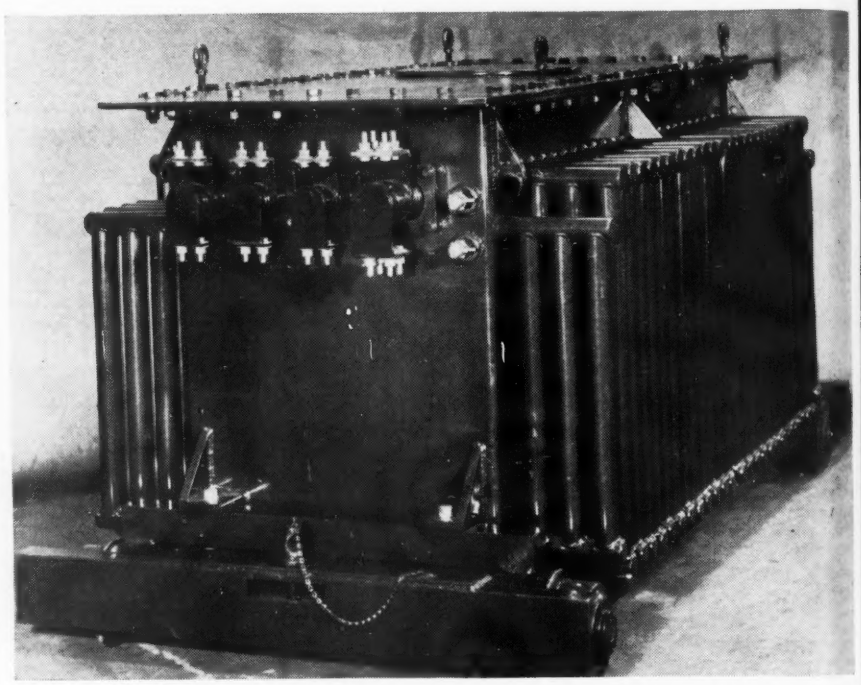


Portable askarel-filled transformer for 300-kw. coal-mining rectifier.

THERE IS at present a definite trend toward increased use of a.c. power in underground mines. This has come about because of new developments in conveying equipment and the many benefits derived therefrom, and the availability of a non-inflammable insulating and cooling medium for transformers.

The use of a.c. motors for underground conveyors, as well as for cutters, drills, fans, loaders, etc. offers many advantages. Among these may be mentioned the following:

1. Increased output due to better voltage conditions at the face.

2. Reduced operating costs resulting from greater efficiency in power utilization (because of lower distribution line losses), lower power conversion losses and higher machine-operating efficiency.

3. Lower investment because of substitution of simple transformer substations for power-conversiond equipment, and the use of less costly types of motors.

4. Reduced maintenance of transformers as compared to rotating conversion equipment.

5. Reduced maintenance of a.c. motors, most of which are of the squirrel-cage type.

Selecting Transformers for Underground Service—Selection of transformers for underground mining installation should be made with a thorough understanding of the characteristics of the three types available: oil-filled, non-inflammable-liquid-filled and dry-type.

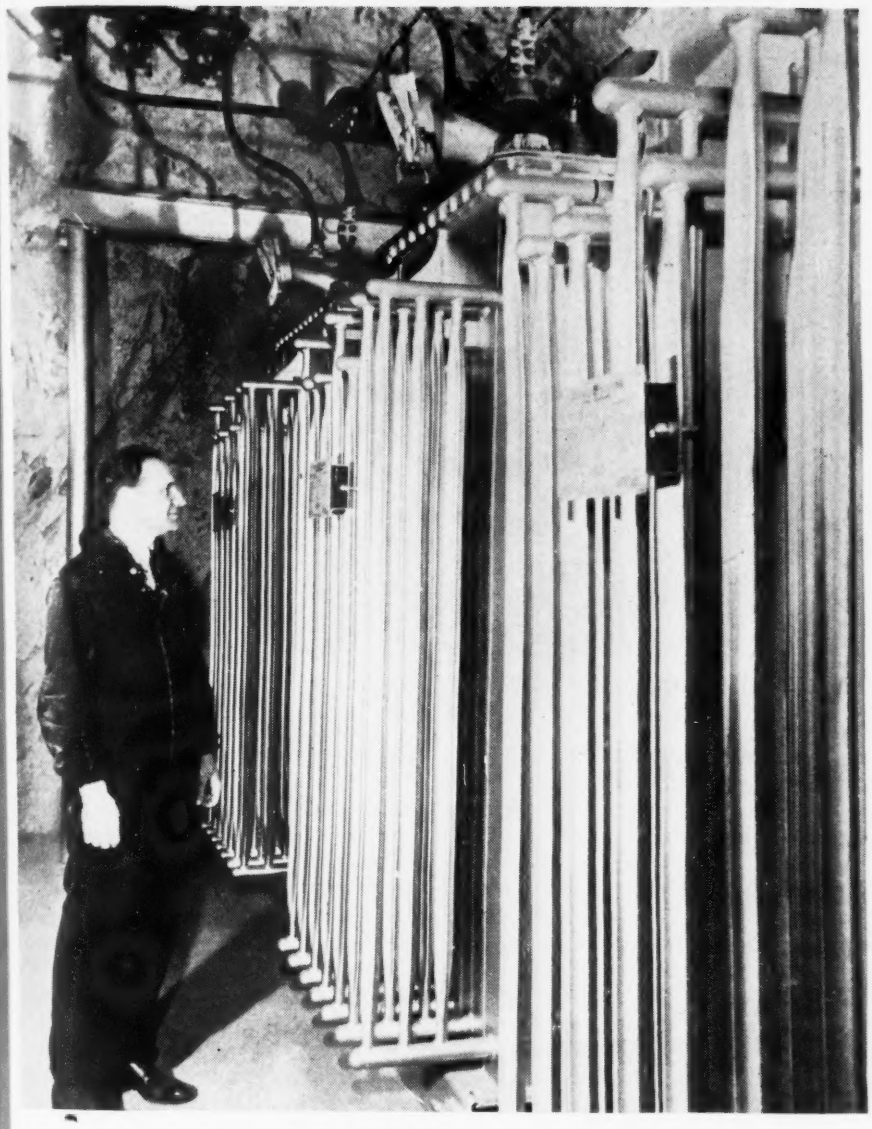
1. The oil-filled transformer is not suited for underground mine applications because the inflammability of the oil presents a very definite hazard to safe operation in confined and restricted locations. If a fire hazard were not present in this type of transformer, it would meet the requirements of mine service, as the steel tank and the liquid protect the windings from exposure to water and dirt.

2. Development of non-inflammable-liquid-filled transformers made possible the installation of these transformers in locations where previously a fireproof vault had been required when oil-filled units were used. Such transformers can be installed underground in mines near the load center without presenting any fire hazard such as would be involved if oil-filled units were installed in a similar location. The insulating liquid and the steel case fully protect the windings from moisture and dirt.

3. Dry-type transformers are now available built of Class B insulating material, thereby reducing the fire hazard to a practical minimum. The windings, however, are exposed to moisture and dirt, making it undesirable to install dry-type transformers where moisture and dirt are generally present in considerable quantities.

History of Transformer Design—The first transformers built years ago were of the dry type with Class A insulation, which is an organic insulation consisting mainly of paper, cotton and varnish. As larger sizes and higher voltage transformers were required, air in combination with such insulations limited both the size and voltage of transformers and it was necessary to resort to forced cooling to build, economically, larger low-voltage air-insulated units.

The introduction of oil, alone or in combination with Class A insulations, provided an immediately favorable medium for insulating and cooling,



Three 1,000-kva. 13,200/2,399-volt single-phase askarel-filled transformers underground.

because of its high unit dielectric strength and its relatively great specific heat and low viscosity. It proved the practical basis for building large high-voltage transformers. The inherent advantages of the liquid-cooled-type transformer, which assured protection from water and dirt and had a high level of strength against lightning, left little opportunity for the dry-type units, except for miscellaneous small low-voltage applications.

Both users and manufacturers, however, recognized that many features of oil could be greatly improved upon. A cooling and insulating liquid was needed for electric equipment which would have the desirable characteristics of oil and yet be non-inflammable and non-explosive. This need was met several years ago when the first commercial application of a synthetic non-inflammable insulating and cooling liquid, now commonly designated as askarel, was made by General Electric with Pyranol. This liquid has the desirable properties of transformer oil, and in addition is non-inflammable, non-sludging and chemically stable.

The National Electrical Code was quick to realize the safety features offered by the non-inflammable-liquid-type transformer, and beginning with the 1935 edition the code allowed transformers filled with an approved liquid that will not burn to be located in buildings without a fireproof vault.

Recently, dry-type transformers have again received consideration for voltages less than 15,000 because of the present availability of inorganic insulating materials, consisting of asbestos, glass, silica and mica, which, combined with a varnish or impregnant, are known as Class B insulation. These materials have good heat-resisting properties and have greatly reduced the fire hazard of previous Class A dry-type units. The present design of dry-type transformers can be used in many locations where there is adequate protection from unusual quantities of dust, dirt, water and transient overvoltages. In other words, they can be used in clean dry indoor locations which are not exposed to lightning.

Transformer Hazards—It is important to note that precautions and restrictions are taken when installing different types of transformers, not because they are necessarily dangerous when in normal operation but to safeguard against what can happen if and when trouble develops. As an example, when installed indoors, oil-filled units are placed in fireproof vaults because of the fire hazard of the oil. Therefore, it is desirable to review the comparative effects possible from the failure of the three types of transformers available today for general use.

Oil-Filled Transformers — When trouble develops and an arc is formed under the liquid in an oil-filled transformer the oil is broken down into gases which, when mixed with air, are highly explosive and inflammable. A serious detonation or explosion may result. In addition, the main body of oil in the transformer may become ignited, causing a serious fire. The gases from the arc disintegration of the oil (whether ignited or not) are of a toxic nature consisting of a high percentage of carbon monoxide, which is extremely dangerous when inhaled. Furthermore, since carbon monoxide gas is colorless and odorless and is not easily recognized when inhaled, it is possible to be overcome by it without warning. Summing up, trouble in an oil transformer may either produce an explosion accompanied by a fire or may release gases dangerous to personnel even when a fire does not result.

Non-Inflammable Liquid-Filled Transformers — Similar transformer trouble in a non-inflammable liquid-filled transformer will not cause a fire or explosion as the liquid is non-inflammable and the gases generated by arc disintegration of the liquid are non-explosive. This has been thoroughly demonstrated in laboratory and field tests. Unlike oil, askarel is a synthetic liquid and it therefore is possible to predict accurately the composition of a gas produced by arc disintegration. Analysis shows that 97½ percent of the gas so generated is hydrogen chloride and that the remaining 2½ percent consists of small quantities of nitrogen and oxygen and

traces of carbon monoxide and carbon dioxide.

Exhaustive tests have been made by the Underwriters' Laboratories, Inc., Chicago, and the following paragraphs are quoted from their report on the gases produced from arc disintegration of transformer askarel:

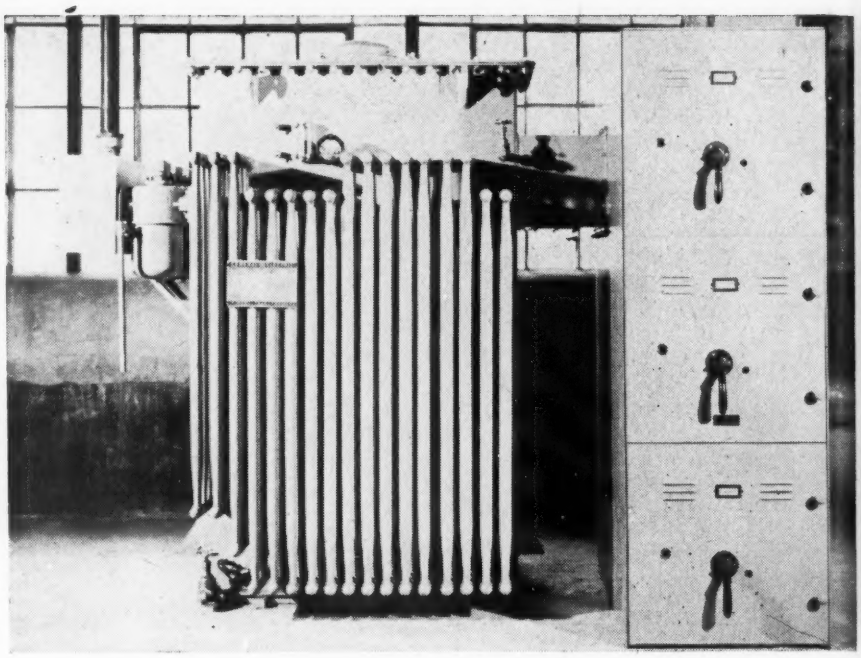
"In the tests with electric arcs, the gases liberated—carbon monoxide and hydrochloric acid—were in such proportions as to be non-inflammable alone or mixed with air. It will be noted that in the case of mineral oil under similar condition, highly explosive gases would be formed.

"The exceedingly unpleasant and irritating fumes from the decomposition of these products, even in concentrations of a very low order, act not only to give warning of their presence but to prevent dangerous exposure of persons. While carbon monoxide* is odorless and toxic, its formation from these products is always accompanied by the simultaneous formation of hydrochloric-acid gas, which gives adequate warning of its presence, as brought out above."

In summation, an askarel unit presents no hazard from fire. Although in very heavy concentrations the gas from arc disintegration of the liquid is suffocating, it gives ample warning of its presence. It is easily dispelled by practical means of ventilation and the quantities absorbed by persons temporarily exposed to any concentration expected in a normally ventilated mine are not harmful.

Dry-Type Transformers—Although inorganic insulating materials are now used in dry-type transformers, appreciable quantities of organic bonding agents also are employed to assemble and bind properly the inorganic materials. These materials have good heat-resisting properties but lose their volatile components as hydrocarbon gases when subjected to the excessive temperatures that may result from abnormal overload or a transformer failure. Since such gases are explosive and inflammable, there is a possibility that an open fire will result. Even if a fire does not result, a failure will produce gas and smoke. Although no published data are available, it is doubtful if Class B dry-type transformers as built today could be classified as being non-inflammable and non-explosive.

When subjected to a transformer failure, Class B insulating materials with the necessary bonding agents in use today will produce carbon monoxide and carbon dioxide. These gases are just as suffocating as the hydrogen-chloride gas from askarel, and in fact may, because of high concentration of carbon monoxide, which is not easily detected, be much more dangerous. As with an oil or askarel transformer, the quantity of gas given off by a dry-type transformer will depend on the magnitude of the fault and the length of time the transformer is on the line before its protective gear operates. Operation of apparatus containing Class B material together with organic bonding agents cannot, therefore, be considered as free from either fire or toxic hazards. From the practical standpoint of the energy required to produce a fire, dry-type transformers may be considered as fire-resisting. Because of its composition, a small volume of the gas given off from an arcing fault in a dry-type transformer is dangerous, and the health of personnel may be endangered when severe internal or external shorts occur.



Indoor load-center unit substation with 750-kva. askarel-filled transformers.

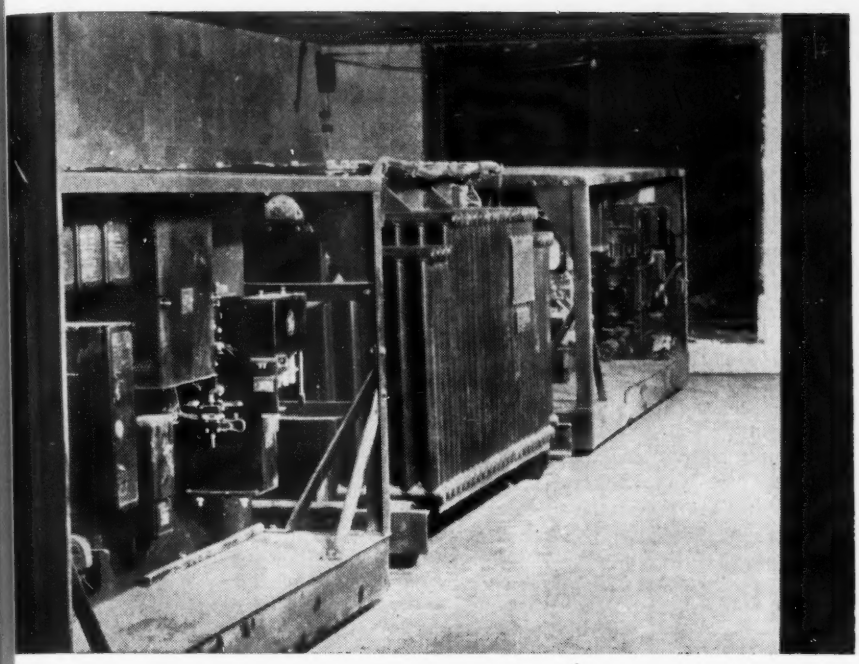
Design of Non-Inflammable-Liquid-Filled Transformers — Transformers having non-inflammable insulating mediums have been developed for outdoor, indoor and underground mining applications. In most details, these transformers are similar to the familiar oil-insulated type. The winding construction is identical with that type, although varnishes that are soluble in askarel have been eliminated.

These transformers are built with a sealed tank which protects the winding and prevents evaporation of the insulating liquid. On sizes over 25 kva. the tank is supplied with a relief diaphragm that protects against possible pressure bursts of the transformer tank should gases form within the tank upon the inception of a maintained arc. As a practical matter, the possibility of a pressure burst in this type of transformer is remote since mining power systems usually do not have the power required for the rapid generation of enough gas to develop such a condition. Hundreds of these transformers have been installed underground in mines in capacities up to 1,250 kva., aggregating over 55,000 kva.

A gas absorber is available for use with non-inflammable-liquid-filled transformers, which, in most cases, effectively eliminates the possibility of gases being released to the surrounding air when a transformer fails. This absorber consists of a pressure-tight sealed steel box that can be mounted on the transformer over the relief diaphragm. When gas in sufficient volume is produced in the transformer a glass diaphragm between the transformer and the absorber ruptures, releasing gases into the absorber, where the hydrogen chloride is neutralized by soda lime.

In place of an absorber it is possible to run a pipe from the relief diaphragm to the nearest return air passage in a mine so that these gases will be expelled with the outgoing air. In a well-ventilated mine, it is doubtful whether either a vent pipe or gas absorber would be considered necessary, as the protective devices used with the transformer can be expected to remove the transformer from the line before a quantity of gas sufficient

* Carbon monoxide represents 0.28 percent of the gas that is given off by arc disintegration of Pyranol.



Portable 300-kw. mining-type rectifier, including askarel-filled transformer.

to produce a suffocating concentration is generated.

Non-inflammable-liquid-filled transformers for a given rating are approximately the same size as air-cooled transformers. They are somewhat heavier, however, because of the weight of the askarel and the strong protecting steel tank. Except in unusual cases, this extra weight, when compared with the weight of the complete equipment, is not a matter of great concern. In addition, the liquid in the transformer has a specific value as it seals the core and coils against exposure to dirt, moisture and corrosive atmosphere. It also permits a transformer to be built economically at an insulation level easily protectable with standard lightning arresters. The heavy tank protects the unit against accidental damage.

For all of these reasons, the askarel transformer is truly an all-purpose unit that can be used inside of the mine near the load center or outside the mine in an outdoor installation. It is true that the use of the liquid means that it is desirable from time to time to check its level and electrical characteristics. Maintenance, therefore, is reduced to the minimum since the transformer can operate for long periods without time-consuming servicing. If filtering ever should be required, this can be accomplished as readily as with oil. However, experience indicates that no regular filtering is required. Handling askarel is non-injurious to the skin. In one factory that builds askarel-filled transformers, the same men have been working with their hands and arms in askarel for many years, and there is no record of a case of hospitalization due to the effects of such exposure.

Design of Dry-Type Transformers—Standard dry-type Class B insulated transformers usually are constructed with the windings exposed to the room air so that sufficient circulation and ventilation may be obtained. Since the windings have insulation and organic bonding agents, there is a possibility of fire and the formation of toxic gases if the transformer is subjected to a short circuit fed from a large power system. However, most dry-type transformers, as in the case of askarel transformers, are protected with circuit breakers or interrupting devices that open before heavy currents are drawn in an arc. Most mining systems are located remote from large blocks of power-generating equipment and contain stepdown transformers and long conductor runs to the distribution centers. The available interrupting capacity on these systems usually runs in the order of 25,000 or 50,000 kva. and therefore the possibility of a dry-type transformer catching fire from this cause is remote.

The atmosphere in a mine is very humid at all times, and particularly so in the summer, depositing moisture on all surfaces of equipment located in the mines. When a dry-type transformer stands idle, moisture tends to condense on the windings. This moisture, absorbed into the windings, may so weaken the insulation as to cause a breakdown when the transformer is again excited.

There also is the ever-present possibility that dirt and moisture will collect and form a coating on the windings of the dry-type transformer. This coating cuts down the radiation of heat from the windings and reduces the effective electrical insulation resistance. Normally, in a dry-type transformer any dry dust and dirt that collects on the windings can be blown off readily at regular intervals and the equipment can thus be maintained in service in a satisfactory condition. However, with moisture present, it is very difficult to remove the dirt and moisture combination, and it is practically impossible to remove the dust thoroughly from all parts of the winding.

Since air has a much lower insulating value than oil or askarel, standard dry-type transformers have an insulation strength somewhat lower than that of liquid-filled units. Therefore they require special consideration if connected to exposed lines, since the usual lightning-arrester application will give them only a limited or insufficient margin of protection. As an example, although no impulse voltage test values for dry-type transformers have been established by the electrical industry, the 5,000-volt class dry-type transformer would have a probable lightning or impulse level equivalent to half that established in the electrical industry for liquid-filled units.

Dry Units Lighter

The dry-type transformer, although approximately the same size as similarly rated liquid-insulated transformers, is lighter because the insulating liquid and its heavy containing tank are dispensed with. Where it is necessary to relocate these transformers from time to time or where suitable handling equipment is not available, the strong inclosing case often proves an advantage. However, most users of this type of equipment provide themselves with the necessary equipment to move large machinery since they usually have large pieces of rotating equipment to move as well.

In conclusion, it may be said that for the average mine, with its generally dusty and humid atmosphere, the sealed inclosed non-inflammable-liquid-filled transformer, with its windings completely protected, presents many advantages and contributes to continuity of on-the-line service. The fact that dirt, dust and water can collect on the dry-type transformer installed in dust- and moisture-laden atmospheres necessitates careful maintenance and constant watchfulness and points to the askarel-type transformer as the best all-around equipment for average mining practice.

CONCRETE FOR MINES:

Shaft, Slope and Entry Applications*

Concrete's Advantages in Shaft, Slope and Entry Work—How It Should Be Used—Grouting to Seal Water-Bearing Strata—Gunite and Plaster Applications and How They Should Be Made

By *ARTHUR E. BELTON*
Akron, Ohio

BECAUSE of the vital importance and permanent character of shafts and slopes, where used, more than ordinary precautions in their construction are necessary. Some form of lining is a virtual necessity as such openings practically always are sunk or driven through materials that either are unstable in their natural state or rapidly become so under the action of moisture, air, mine gases, vibration or impact.

Shaft and slope linings should support the surrounding materials, provide protection against slaking and offer a minimum of obstruction to free passage of air currents. They should provide a tight seal against an inflow of water, maximum resistance to damage from fire and explosion, and in shafts a secure support for skip guides, buntons, piping and ladderways. As a matter of economy, they should be reasonable in first cost and require very little, if any, maintenance. In both American and modern European mining practice, shaft linings are now quite generally built of concrete, since no other material that might be used for the purpose so completely meets these requirements.

Concrete linings impose no restrictions on the size and shape of a shaft. This is a decided advantage where rock or water pressure makes a circular or elliptical shaft lining desirable. Furthermore, alterations or repairs ordinarily can be made with little, if any, interruption to production, and with a minimum of danger to workmen, since individual parts of such a structure are not dependent upon other parts for temporary support.

Experience shows that ordinary timber shaft linings have a maximum useful life of approximately twelve years, while good concrete linings should outlive the mine. It is true that some concrete linings have given trouble after several years, but in every case the trouble has been traceable to some avoidable cause. If proper practices are followed, such difficulties will be eliminated.

CONSTRUCTING CONCRETE SHAFT LININGS—In addition to the rules for making good concrete set forth in the March issue of Coal Age (p. 90), there are certain simple yet fundamental precautions in using concrete for shaft linings. Failure to follow these rules and to observe these precautions, or carelessness in methods and selection of the materials used, may result in otherwise unnecessary maintenance charges or even partial failure of the lining. Observance of these precautions is particularly important where shafts are used in carrying downcast air in cold climates.

Concrete for lining must be made of aggregates of known resistance to destructive agents in the particular locality. It should be a rich, dense mix, and should contain no foreign substances likely to be affected by mine water or readily soluble. Concreting should be carried on so that water from the surface or through the strata will not enter or come in contact with the concrete until it has thoroughly hardened.

It has already been pointed out that the strength and impermeability of concrete are largely dependent upon the quantity of water used in the mix. Water, being non-compressible, will remain locked within the mass until the concrete has hardened. After the form is stripped, this impounded water finds its own way out, leaving small voids and channels that are later sources of leakage if exposed to a head of water. Should water collect in these voids and freeze it will exert a bursting pressure which eventually may considerably damage the structure. Chemical salts recrystallizing from solution will have a similar effect.

No precaution in shaft-lining construction is more important than avoidance of excess water. The most successful shaft linings known are those in which only an absolute minimum of mixing water consistent with proper placement was used. It is particularly injurious to drop concrete into a pool of water standing in a form, since the resultant washing forms aggregate strata in which there is comparatively little cement, and usually leaves the mass honeycombed.

WATER-TIGHT JOINTS—Even in concrete made of clean, well-graded aggregates and mixed with a minimum of water, some laitance may form at the top after a day's work. The concrete immediately below this laitance will have greater porosity due to the accumulation of water at the surface. If allowed to remain, this laitance and porous concrete will be a source of future leakage and disintegration.

To avoid this difficulty, several inches of concrete at the end of each day's work or similar stopping point should be removed just after the concrete has stiffened and before it becomes too hard. The surface then should be cleaned with a stiff bristle brush without the use of water, and all loose particles of aggregate removed. If the form is overfilled to a depth of 1 or 2 in., it will facilitate this operation.

Before concreting proceeds at any joints, it is advisable to apply a coat of approximately ½ in. of fairly stiff mortar (1:1 mix) brushed into all irregularities in the old surface and immediately covered with fresh concrete.

THE MIX—Concrete for shaft linings should be mixed a minimum of 1½ minutes in a standard revolving

* Second in a series of articles on concrete work based on 1943 thesis (see *Coal Age*, March, 1944, p. 90). Special acknowledgment is made of sources as follows: "Concrete Shaft Linings at Pennsylvania Bituminous Coal Mines," Newell G. Alford, *Mining Congress Journal*, April, 1932; Robert Peale, Mining Engineers' Handbook, 3d ed.; also "Concrete," and other publications of the Portland Cement Association.

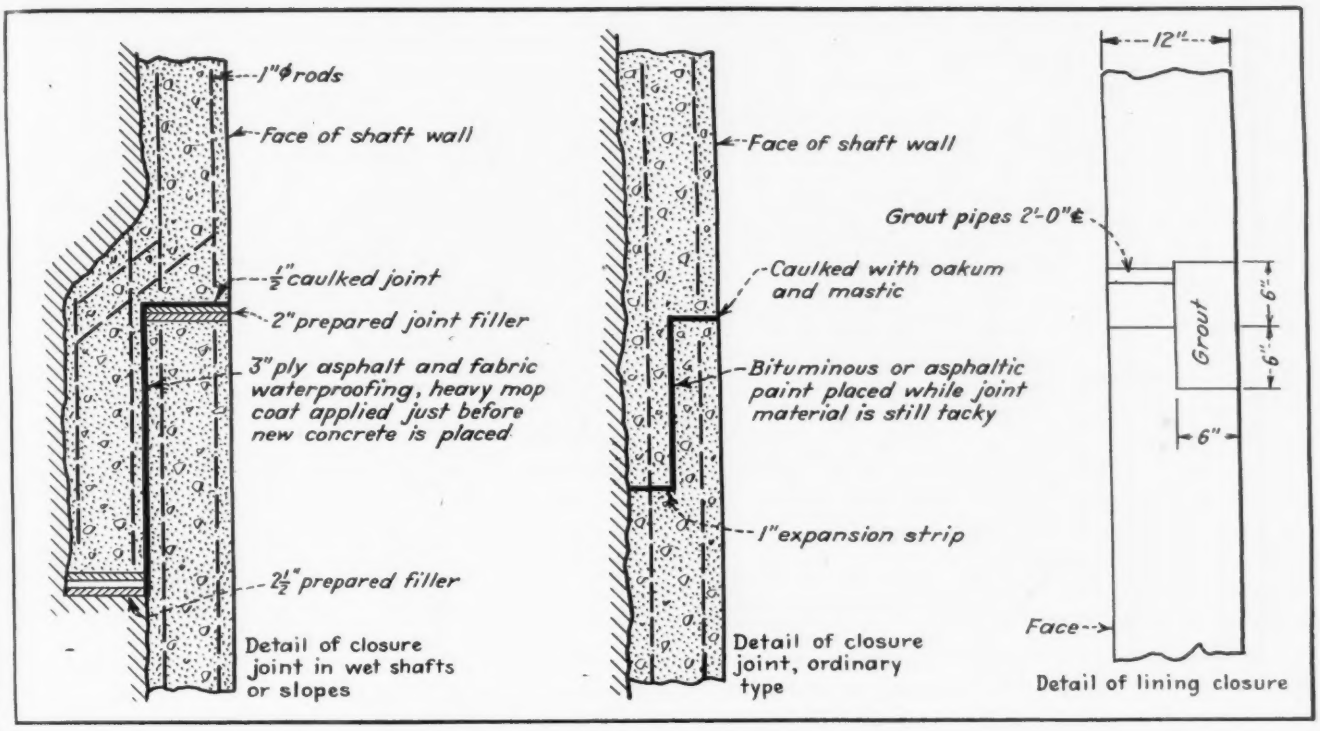

1"ϕ rods
Face of shaft wall
½" caulked joint
2" prepared joint filler
3" ply asphalt and fabric waterproofing, heavy mop coat applied just before new concrete is placed
2½" prepared filler
Detail of closure joint in wet shafts or slopes
Face of shaft wall
Caulked with oakum and mastic
Bituminous or asphaltic paint placed while joint material is still tacky
1" expansion strip
Detail of closure joint, ordinary type
12"
Grout pipes 2'-0" c
Grout
6"
6"
6"
Face
Detail of lining closure

Fig. 1—Specimen closure joints for concrete shaft linings.

drum mixer. It should not be leaner than a 1:2:3 mix, nor contain more than 6½ gal. of water per sack of cement, including moisture in the aggregate. The nature and grading of the aggregates should be such that the mixture can be placed without segregation or accumulation of water on the surface. Concrete should be conveyed to the forms so that it does not segregate. During placement, it should be spaded thoroughly in layers not more than 12 in. thick to remove impounded air and water.

A very effective implement for compacting concrete consists of a pneumatic hammer having a broadface tool in the chuck. With this tool, the form is vibrated on each stud or cleat around the shaft lining while the concrete is being placed. When this treatment is used it should be supplemented by spading.

Chutes for placing concrete are satisfactory if properly used, but there is a tendency with chutes to mix too wet a concrete to make it flow along a relatively flat grade. Too steep a chute will result in segregation. The best angle for general purposes is 25 to 30 deg., permitting the concrete to flow and not roll.

PLACING CONCRETE — In placing concrete, it is imperative to bring it up in the form at as nearly uniform a rate all around the shaft as possible. If the concrete is heaped in one location, excess water and fine materials run away from the coarse aggregate, leaving a porous spot in the wall. For this reason, concrete which is dumped on or piped to a working platform and then shoveled into the form usually is more uniform than concrete placed by chutes, which generally remain too long in one spot.

FORMS—Type of form used is immaterial except that it should be tight enough to prevent loss of materials and sufficiently well braced to maintain proper alignment. Forms ordinarily are built in heights of 2 to 6 ft. and one complete ring, or lift, constitutes a set. In the absence of earth or water pressures and in temperatures above 60 deg. F., wall forms may be moved after approximately 48 hours. Under other conditions, the period should be increased to permit development of adequate concrete strength. Temporary bracing between walls after removal of the forms may be advisable in loose material or where slides are likely.

Back forms of sheet metal, overlapped like clapboarding, fastened to the rib and left in place, can sometimes be used to advantage in deflecting water from the fresh concrete. Space between such forms and the rib should be grouted before the shaft is put into service. The metal should be thick enough or sufficiently braced to hold the pressure of wet concrete without deflection or distortion. Corrugated sheets will permit use of a lighter gage than plain. A modification of the back-form idea may be used at closure joints to prevent leakage, provided a tight job of grouting is done after the lining is in place.

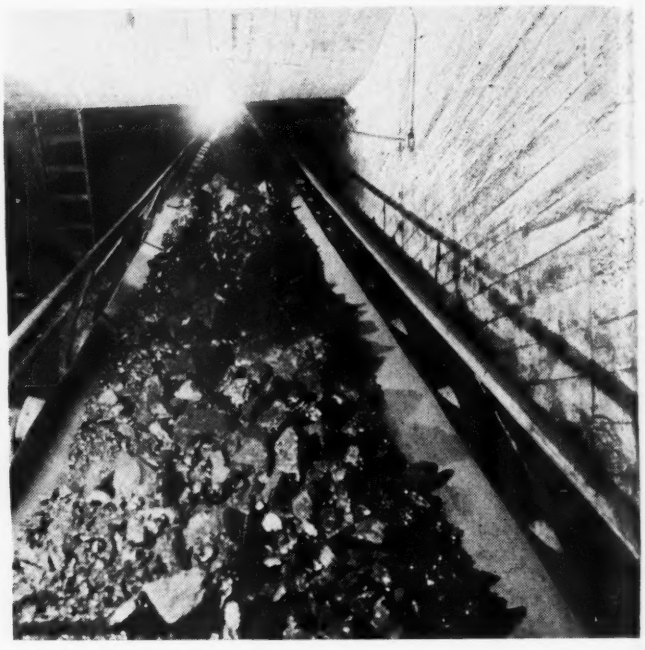
SHAFT LINING CONSTRUCTION—Two general methods are used in building concrete shaft linings. In one, the shaft is sunk and the lining placed in sections 20 to 60 or more feet in height, depending upon the stability of the surrounding material. Work is carried on from the bottom to the top of each section. Points requiring special attention are the closure joints between successive sections. Three types are shown in Fig. 1.

In the other method, work progresses from the mine bottom upward until the top of the curb or collar is reached. This method is applicable only in shafts where exceptional stability of rib prevails or in relining old timber shafts.

A third method sometimes is employed where the shaft is located in marshy ground or very loose overburden materials. In this caisson process, successive rings of concrete are cast one upon the other at the ground surface and allowed to sink by their own weight accompanied by excavation within the shaft. A lining of this character generally is started on a cast-iron or steel shoe or cutting edge, and sinking is assisted by the use of water jets or top-loading when required.

Very tight joints and concrete of excellent quality can readily be obtained when caissons are used, but the

Guniting provides easily applied and low-cost protection for entries and other openings.



Concrete offers a low-cost lasting method of lining slopes and shafts.

method is uncertain in loose materials, which may jam or "hang up" the caisson. It is seldom, if ever, used below the surface of the rock, partly because of the danger of accident to the caisson due to blasting operations and partly because of sinking difficulties.

DISPOSAL OF GROUND WATER IN SHAFTS—Water encountered during excavation or subsequent thereto is the greatest problem in shaft construction, and is the primary, if not the sole, cause of such impairment as has been observed in concrete linings. The danger from ground and rock water is twofold. First, water flowing into freshly placed concrete may wash out some of the cement or by its presence in the mass increase the porosity and reduce the strength, the same as with excess mixing water. Second, water under pressure back of the hardened lining will find its way through imperfect joints or porous spots in the concrete, if any exist.

Freezing of entrained water and leaching out of essential ingredients are likely to result in the formation of porous spots. As these actions continue the minute openings are enlarged and the rate of disruption increases.

It is only by keeping water from entering the concrete that possible trouble can be avoided. This can be done by completely sealing the rib with grout or by making a lining that is itself impermeable. Because of the difficulty of building a shaft lining wholly watertight, it is advisable to provide back drainage where sealing with grout is not completely accomplished.

Opinion is divided as to which of these two methods of disposing of water is preferable. Many engineers hold that back drainage is essential while others believe that with persistence and care grouting, combined with a well-built concrete lining, always may be depended upon to eliminate further trouble. Both methods have been successful when properly done.

BACK DRAINAGE — Adequately designed back drainage undoubtedly is the easiest way out of the problem of water disposal. Under this method, water usually is collected in rings outside the shaft lining and either pumped to the surface or drained through pipes to the bottom for collection in the main sump. Water rings are located just below the water-bearing strata and, in glacial drift, at the surface of the rock to take care of flow in wet weather. It is best to line rings with concrete and provide means of support for the hanging rock to prevent loss of capacity due to rock falls. Ring capacities should be more than ample to take care of the largest flow encountered.

DOWN PIPES—Down pipes of large diameter are desirable since small pipes often are plugged by mineral deposits after a few years. A suggested drain pipe is a 6-in. box built into a hitch in the rib behind the lining and incased in concrete when the shaft lining is placed. A stove pipe may be used. A chain hung in may be used to remove mineral deposit but requires replacement. A water ring never should be located at a closure or day's work joint in the shaft lining because of the additional leakage danger.

DRILLHOLE DRAINAGE — In case that, despite all precautions, some leakage occurs through the lining it sometimes is possible to carry water to the bottom by drillholes outside and back of the lining. Such holes are drilled from the surface after the shaft is built. They must be reamed out from time to time to free them from debris and mineral matter.

Water of condensation and drip from skips and cages may result in some trouble if the concrete is porous. In a Detroit salt mine, condensation in the downcast shaft is eliminated by passing the incoming air over steam coils. Much of the drip from skips and cages can be eliminated by locating the sump at the side of the shaft and below the grade of the landing.

Slope Linings

Problems of slope lining are quite similar to those encountered in shafts. Where the greatest permanence and safety from rock falls is desired, slope

linings usually are built of concrete. They also occasionally are built of "gunite." The former type of lining may be used under all conditions, while the latter is adaptable under conditions where no ground or water pressures exist. Gunite ordinarily requires some maintenance after several years, especially if unreinforced.

In lining slopes it always is best to drive the slope out before starting to place concrete, using temporary means of support if required. Lining then is done from the bottom to the portal. This way the plastic concrete, which is supported in an inclined position, always will bear against the previous day's work, thus tending to produce tighter closure and construction joints with a minimum of effort. The precautions governing the use of concrete in shaft linings are equally applicable to slope linings.

Slope linings are built with either a rectangular section or in the form of an inverted U. The lining thickness varies from ¾ to 1 in. of gunite, which merely protects the rock from slacking, to 12 or more inches of plain or reinforced concrete. The thickness and reinforcement requirements depend upon the ground conditions and somewhat upon the uses of the slope. Where the direction of the air is downcast, temperature reinforcement is required to prevent cracking and joints should be left at intervals of about 30 ft.

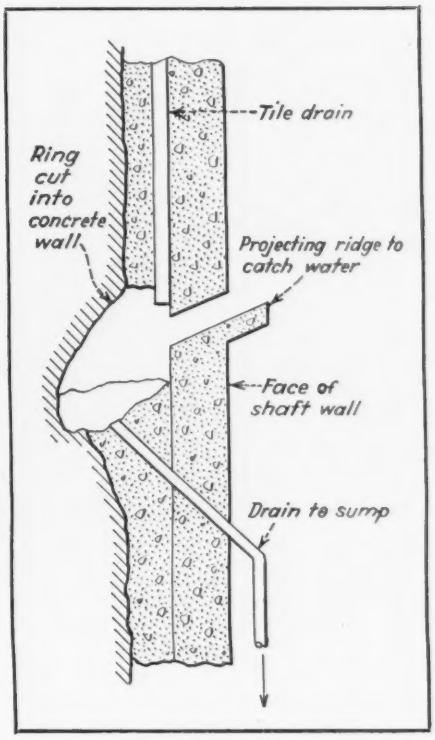


Fig. 2—Example of water-ring construction for concrete-lined shaft.

Entries and Special Rooms

In every coal mine there are certain passages and rooms used daily either throughout the life of the mine or for the time required to work out any particular block of coal. This may involve from 20 to 60 or more years. Such parts are so vital to safety and production that construction of a character which will be permanently fire safe and eliminate rock falls or other accidents is particularly advisable if not imperative.

Structures which fall within this category are permanent haulways, airways and manways, stables, motor barns, shops, tool rooms, emergency hospitals, refuge rooms, foremen's offices and rooms which house units in main power or drainage.

It is quite common to find structures of this character built either wholly or largely of concrete. In addition to the possibilities of economy which it affords, concrete provides adequate protection to equipment and creates a sense of safety among the personnel who use these facilities.

Concrete linings are used in main haulways, airways and manways to replace or supplant timbering. Three general types, each having a number of possible variations, are in common use, selection of type being governed by design requirements, cost and availability of materials.

FLAT-SLAB ROOFS — A type adaptable to entries where the roof is moderately firm and relatively thin consists of a plain or reinforced concrete wall section on both sides of the entry supported on a footing somewhat below the base of rail and carrying a reinforced-concrete flat-slab roof. Walls are 8 to 12 in. thick and even more where water is encountered. They do not ordinarily require reinforcement except where grouting may be undertaken or rock movement may occur.

THICKNESS AND SIZE—Thickness of slab and size and spacing of reinforcement in the roof are matters of span width and weight of material supported. Since mine roofs, even under the worst conditions, seldom break more than a few feet over the coal, the load on the slab is not as great as might be supposed. Experience under similar conditions is the only safe guide in determining these factors. Minimum slab thickness and quantities of steel will be required where the roof is constructed with a continuous concrete bracket at each wall.

CONCRETE AND STEEL LINING—Another type of lining frequently used in low entries is a combination of concrete walls or rib sections supporting steel beams spanning the entry. The beams are either bedded in concrete with a reinforced-concrete slab on the upper or lower flanges or short arch spans are carried on the lower flanges. The space above the slab or beams is packed with gob and slate.

ARCH LINING—Where the coal seam is thick or where the roof breaks high, an arched lining is most economical. This type also is adapted to wide entries where intermediate supports or heavy roof-slab construction is undesirable. In this form of lining, rib sections are 8 to 18 in. thick. Reinforcement of bars or old rails is used in arch sections where there is rock movement or where grouting is to be carried on through the lining.

FORMS—If the arch forms are constructed in sections about 5 ft. long, each section can readily be moved in one piece on a flat car. Lagging is made up in panels about 2 ft. wide with cleats on the reverse side, so arranged that the panels may be pinned or bolted to the stringers. With this type of form, panels are placed progressively as needed from the springing line upward, thus permitting concrete of normal consistency to be placed through the center opening in the arch until the crown panels are reached, after which filling is carried on through the end bulkhead, using a concrete of dry consistency.

Where steel beams are used in the flat roof lining, it is best to hang the roof forms 1½ in. below the bottom flanges of the beams and provide wire mesh or chicken netting, wrapping around the beams for reinforcement. This way the concrete covers and protects the steel from gases and moisture. The flat surface also prevents lodgment of dust. Beams which are bedded are less readily bent or blown down by an explosion than where the roof slab is supported on the top flange.

GUNITE LININGS — This type of lining frequently is used to protect openings by preventing slaking. It is applied directly on the roof and rib. It never should be less than ¾ to 1 in. thick and must be maintained by "spotting," or re-covering, areas where

rock movement, water pressure or excessive vibration may have caused scaling. Freshly placed gunite should be tested with a nail or some similar device before hardening takes place to detect thin spots which if not built up to proper thickness may cause future trouble. Gunite of the above thickness ordinarily will require placement in two coats.

Methods of lining or protecting stables, rooms, shops and such facilities are similar to those used in entry mining. Powder boxes nailed to the rib forms and left in place after the concrete has hardened make useful receptacles for tools and stock.

In mines using motor equipment, charging stations and repair shops located underground make it possible to keep the rolling stock in good condition and up to full efficiency without removal from the workings. Such stations and shops should be fireproof because of the extra hazard involved in the operation of charging equipment, power tools and welding apparatus. They also should be waterproof and protected from accumulations of dust or explosive gases.

Plaster and Gunite

Cement and sand mixtures in the form of plaster and "gunite" are used extensively in a wide variety of mine structures. Next to concrete they offer the best possible means of protection from fire, moisture, decay and corrosion. In the form of stucco, mixtures of this character have excellent decorative possibilities for use on the exterior of surface structures where appearance must be considered. The variety of color and texture possible in portland cement stucco is almost unlimited and as a surfacing for mine dwellings, wash and change houses, offices and other buildings it is artistic, durable and moderate in cost.

PLASTER USES—Below ground, cement plaster is successfully used to protect steel timbers, pipes and tanks from the corrosive effect of acidulous water, gases or atmospheric moisture. As a protective coating on wood timbers, plaster prevents the start and spread of fire and retards decay. Applied to a thickness of $\frac{3}{4}$ in. or more, cement plaster is an effective seal against the passage of air through stoppings of gob or masonry, line brattices and bulkheads used in conducting mine ventilation.

Plaster and gunite when properly applied and maintained retard and, in many cases, prevent swelling and slabbing of slates, shales and other rocks which have a tendency to disintegrate. Such mixtures should not, however, be depended upon to resist water pressure or load due to squeeze or movement of the rock.

Plaster is preferable only on small areas of surfaces or on the exterior of buildings. Gunite, which is the trade name for the cement-sand mixtures placed with the "Cement Gun," ordinarily produces a denser, stronger and more tenacious surfacing than do plasters applied by hand methods. On large areas the gun generally is more economical of both time and money.

PLASTER MIXTURES—Plaster mixtures generally are composed of cement, sand and hydrated lime in the proportions of one part of cement to three parts of sand with 10 to 15 percent of hydrated lime by weight of cement added for the sake of smoother working qualities. In gunite mixtures, the lime is omitted. The sand should be clean and free from organic matter or loam. Material that will pass a $\frac{1}{8}$-in. mesh screen and be retained on a 100-mesh is preferable for plaster, while a coarser sand may be used in gunite. A sand containing much fine material is likely to crack in drying out.

APPLYING PLASTER—It is best to apply plaster in several coats rather than to build up the desired thickness in one coat, since the first coat offers an absorptive backing for succeeding coats, which results in a denser, more waterproof plaster. Furthermore, the material is less likely to sag away from the surface on which it is applied. Ordinarily three coats are required with a finished thickness of $\frac{3}{4}$ to 1 in. Each coat should be cured by keeping it damp for at least 24 hours after placement and succeeding coats should not be applied until the base coats have dried sufficiently to provide a proper degree of suction. On exterior work the finishing coat should not be applied until the next preceding coat is at least 10 days old.

REINFORCING—Except on gob or masonry surfaces, such as rough concrete or cinder blocks, it is a matter of insurance and sometimes necessity to reinforce the plaster with chicken netting, wire mesh or expanded metal. Such materials preferably should have openings at least $\frac{3}{4}$ in. in diameter. The reinforcement should be held away from the supporting surface by nailing crimps or furring staples. This makes the mesh a true reinforcement instead of merely a mechanical hanger for the plaster. On rock faces staples may be driven into nailing plugs in seams or drill holes. Reinforcement always should be used over either steel or wood timbers since the smooth steel surface will not in itself provide sufficient key for the plaster and wood has a tendency to warp, check, shrink or move under the plaster and cause cracks.

Gunite often is applied directly without reinforcement on the surface of the rib or roof in entries, slopes and special rooms. This practice is satisfactory provided the condition of the rock is such that a good bond is obtainable. To obtain a good bond all loose scale, dirt, dust and disintegrated material must be removed before applying the first coat of gunite. Wet surfaces do not provide a good bond for gunite or plaster. The best condition is damp but not saturated surface.

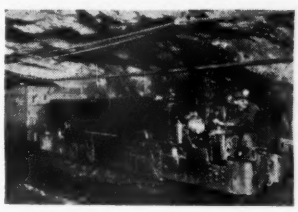
PREPARATION OF SURFACE—Plaster and gunite should not be applied to a bone dry surface (rock or wood) since much of the moisture necessary to proper hardening of the cement may be lost by absorption. The rougher the surface the better the mechanical key and consequently the bond. A fairly smooth surface such as is found in some slate roofs will hold plaster or gunite provided moisture conditions are right and the first coat is thin and applied with some force.

The application of hand-placed plaster on exposed rock surfaces, without the use of reinforcement, is not generally recommended. When it is the practice, however, the first or scratch coat should be applied in the form of a dash. A stiff whisk broom or bundle of thin reeds makes a good tool for dashing on plaster. The plaster is mixed fairly wet, the brush is dipped in it and the wet mixture is snapped at the surface to be covered. The dash coat should be allowed to harden without troweling or other manipulation.

It may be said that the success or failure of gunite work depends upon the man holding the nozzle. This is true to a great extent, but the condition of the backing material, quality and quantity of ingredients and thickness of placement in a single operation also play a very great part. Before undertaking a gunite job it is best to acquaint the manufacturer of the equipment with the conditions surrounding the work and follow directions as closely as possible.

POWER

WHEN AND WHERE IT'S NEEDED



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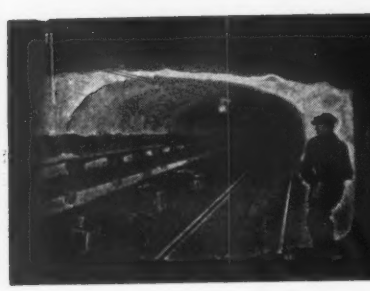


THE FOREMEN'S FORUM

Acid Water Emits Hydrogen in Metal Pipes

Sulphuric Acid in Water Acts on the Iron in Pipes—When It Escapes, Either at Discharge or at an Opened Summit, It May Become Ignited

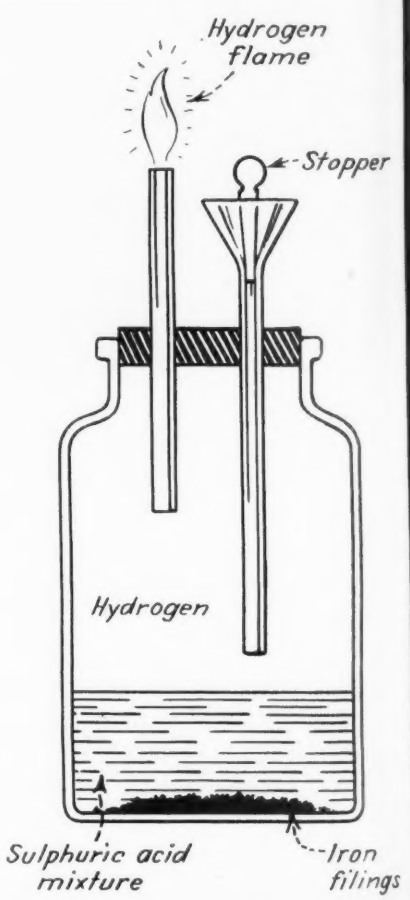
RARELY is hydrogen suspected as being a coal-mine gas, yet its presence in modern workings should be suggested by that familiar experiment of adolescent days, the dropping of iron filings or small nails into dilute sulphuric acid, whereupon a gas was evolved that was readily combustible and had an exceedingly bad smell. The gas was hydrogen, and the evil odor was derived, one was told, from sulphuretted hydrogen and compounds of sulphur and iron which had their origin in the impurities of the pipe metal.

Pipe Filled With Hydrogen—Such a gas and such a smell escaped from the end of a water pipe in a British mine when pumping was resumed after a short suspension. Apparently the water had receded in the pipe and pump and, as it retreated slowly, the pipe filled with hydrogen made by the chemical action described, that gas being trapped by water held by a knuckle in the line. Mine inspectors in making analyses found 57 to 90 percent of hydrogen in the parts of the pipe when the air within it was at rest.

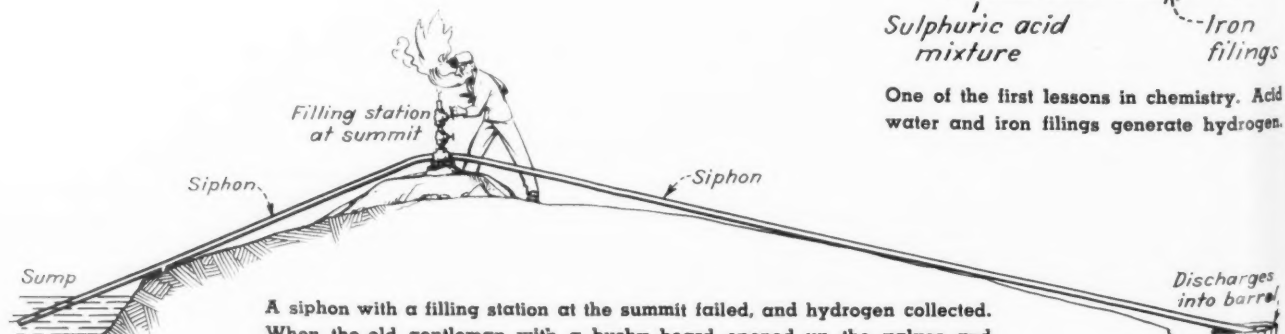
It is interesting to note that one pound of iron will cause to be evolved from hydric sulphate, by replacement of hydrogen, 0.05414 lb. of hydrogen and capable of making a 4.25 percent mixture with 229 cu.ft. of air—roughly 240 cu.ft. of the mixture. Enough iron is lost by a pipe through direct chemical action to account for explosive atmospheres being generated therein. Thus an 8-in. pipe, 29 ft. long, would generate enough gas by the loss of a pound of iron to fill the pipe completely. Such a weak concentration of gas would not burn in the pipe but might burn when expelled from the pipe, authorities putting 4.1 percent as the lower explosive limit of hydrogen, though the combustion is only partial and not violent (Bureau of Mines Bull. 279, p. 15-17).

American Experiences—That dangerous atmospheres are so created is matter of wide knowledge. Inspector Blick, of Pennsylvania, long deceased, had such an explosion in his district. A man opened the vent of a siphon at the summit, and the gas ignited with a violent explosion. On another occasion a man opened the plug at the top of a siphon which he then proceeded to fill from that point. Trying to observe the rise of the water he held his light down near the pipe, and a flash occurred which burned off the whiskers on one side of his face. Others have been burned while opening and examining split centrifugal pumps. Knowledge of such burnings seems common, though safety men are none too generally informed as to the hazard. Perhaps, it is hydrogen generated by the siphon pipe and acid water and not bubbles of air alone that terminate the flow of siphons, which theory would suggest that rubber, indurated fiber or cement-lined pipe would make better siphons than plain steel or iron pipe.

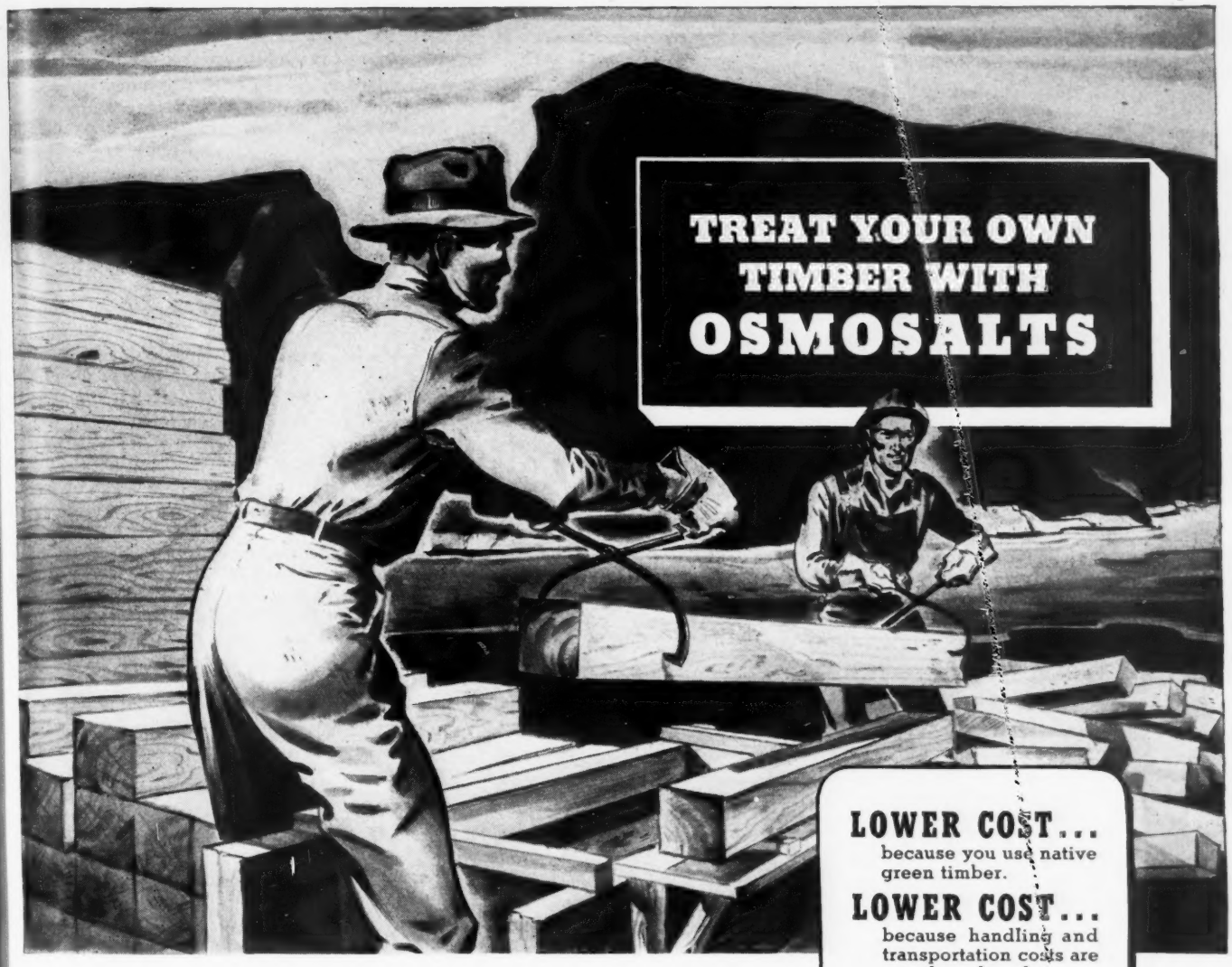
In general, the phenomena are ascribed to sulphuretted hydrogen, the presence of that gas being attested by the smell, but this is an unlikely conclusion because that gas is lethal far and away below its explosive limit. Others believe the gas is methane, which, indeed, may often be true, for where coal forms the bottom of a sump, or lies still farther below the coal being mined, methane may rise through the water, pass into a submerged pipe and



One of the first lessons in chemistry. Acid water and iron filings generate hydrogen.



A siphon with a filling station at the summit failed, and hydrogen collected. When the old gentleman with a bushy beard opened up the valves and peered in the gas escaped, caught fire and burned off his chin whiskers.



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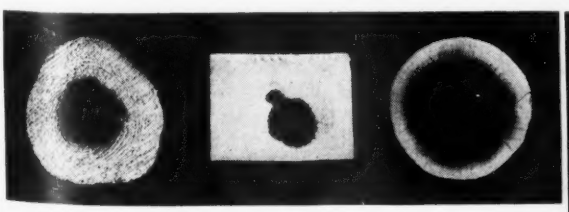

Illustrated above are cross sections of three kinds of timbers. The white outer areas, which have been subjected to standard color reagent tests, show the deep penetration of the toxic salts in Osmoplastic.

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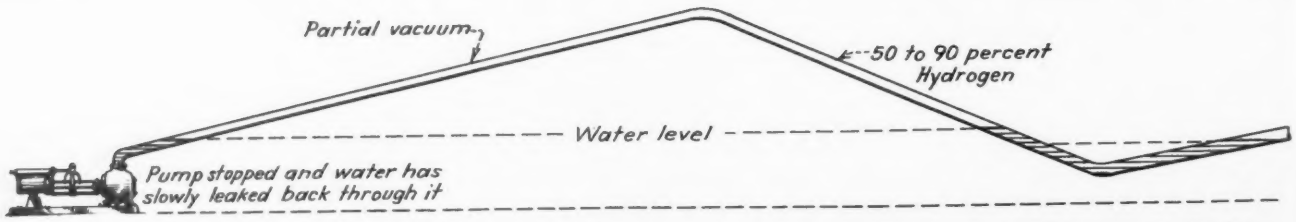

A pump on a line that passed over a hump and then dropped into a swag was stopped. Part of the water in the hump ran out through the pump and made a partial vacuum which the acid water, acting on the iron, filled with hydrogen.

enter the water line above it, where it will accumulate if the pipe is bent at more than a right angle in its course. Enough has been said to suggest that hydrogen may be found in acid mines wherever there are metals and especially is it likely to be evolved in pipes. The gas may be generated whenever damp sulphurous coal is allowed to slide down or lie on zinc-coated plates.

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The Five Lazy Gases In the Atmosphere

In the early years of the science of chemistry, after the chemists had made a few false steps, the air was regarded as consisting of two gases, oxygen and another gas they at first termed "azote," which means something "incapable of supporting life," meaning, in other words, something other than oxygen. Scheele (1772) termed oxygen, "fire air" and azote "foul air." Cavendish in 1785 found that when, with an electric spark, he made azote to combine with oxygen and then removed the azote by potash and the oxygen that was left by an oxygen-greedy substance, "liver of sulphur" (potassium sulphide and polysulphides), some gas refused to react and still remained, but no one thought this fact significant or important. Later, Chaptal, a celebrated French chemist, of the Napoleonic era, said azote should be termed "nitrogen," for it was found in "nitre," or "niter," and the word "azote" gave way to the newer appellation. Everybody thought for years that azote and nitrogen were one and the same gas, and that either name could be used indiscriminately.

Discrepancy Unmasks a Gas—But after a long while, Lord Rayleigh found that azote is 1.00488 times as heavy as the nitrogen from nitre, and chemists, grown more critical, were at a loss to explain that difference. Still later, 1894, Rayleigh and Ramsay found azote was nitrogen plus argon, that there were at least three important gases, not two, in air. So the gas that Cavendish could not remove by reactions was mainly argon, meaning the lazy gas, the gas without enough energy to combine with other gases or with fluids or solids. Unfortunately, chemists still have a way of writing "nitrogen (azote)" as if the two words specified one and the same gas. However, after a while, it was found that argon was not the only other gas in azote.

All of which would be of little consequence if the books which say that air contains 79 percent of nitrogen by volume (instead of 78.03 percent of nitrogen + 0.93 percent of argon) did not proceed thereafter to give the specific gravity of pure nitrogen and thus make calculations wrong, for if the mixture of inert gas is meant, the specific gravity of that mixture should be given and, on the other hand, if the nitrogen percentage is correctly stated, the specific gravity of pure nitrogen should be given.

The Four Other Gases Found Later—The word "azote" should be restricted to its former meaning: namely, all inert gas in air excluding carbon dioxide or, as we would say, the mixture of inert gases in air with carbon dioxide excluded, for, not to mention nitrogen, there are neon, krypton, helium and xenon at well as argon in air, and this mixture it is that is 1.00488 times as heavy as nitrogen. Argon, next to nitrogen and oxygen, by long odds is the most important gas in air from a volumetric basis, excepting sometimes water vapor, the importance of which varies immensely with its varying degrees of saturation and temperature.

But it is too late to turn back the word "azote" to its former significance. Instead, to avoid any ambiguity, the analysis of air by volume should be given at 21 percent oxygen, 78 percent nitrogen and 1 percent argon, which is near enough for all purposes. It is not worth while to be too finical, for the quantities vary a little with the location at which the sample is taken. One may as well forget the expression "azote" or "atmospheric nitrogen," for, after all, the gases ("rare gases" or "noble gases" as they are termed) are not any more in the nitrogen than in the oxygen of the air. They are a part of the whole mixture, and when the nitrogen and oxygen in air are separated by compression and cooling, to make liquid oxygen, the argon stays with the oxygen, not with the nitrogen

These rare gases are not to be regarded therefore as the spawn of nitrogen. However, these rare gases are all somewhat alike. They are inactive, and each molecule contains only one atom, but these characteristics separate them from oxygen almost as much as from nitrogen, for nitrogen is not by any means entirely inactive, and its molecule has two atoms.

It is the custom when making air analyses to record all the inert gases except carbon dioxide together as nitrogen, but the specific gravity that should be applied to such an analysis should be, of course, that of such gases, namely 1.0721; not that of nitrogen, 0.9674. This artificial aggregation of gases therefore would have a specific gravity higher than oxygen, which is 1.1053. However, the aggregation probably does not exist in nature but only in the textbooks, for, as stated, these lazy gases are mixed with the air and not solely with the nitrogen, and stay with the oxygen, not with the nitrogen, when the major gases are separated by compression.

Such variations from accuracy and completeness as have been described are not uncommon, for chemists do not always differentiate between iron and aluminum, but record both as iron. Similarly, many elements in coal find themselves marshaled under wrong classifications. Of alkalis, for instance, one would suppose there are but four in coal—calcium, sodium, magnesium and potassium—because hardly anyone troubles to look further, but in so doing the chemists overlook barium, lithium, strontium, caesium and rubidium, though the first two probably are present and the rest may well be, as they are found in vegetation.

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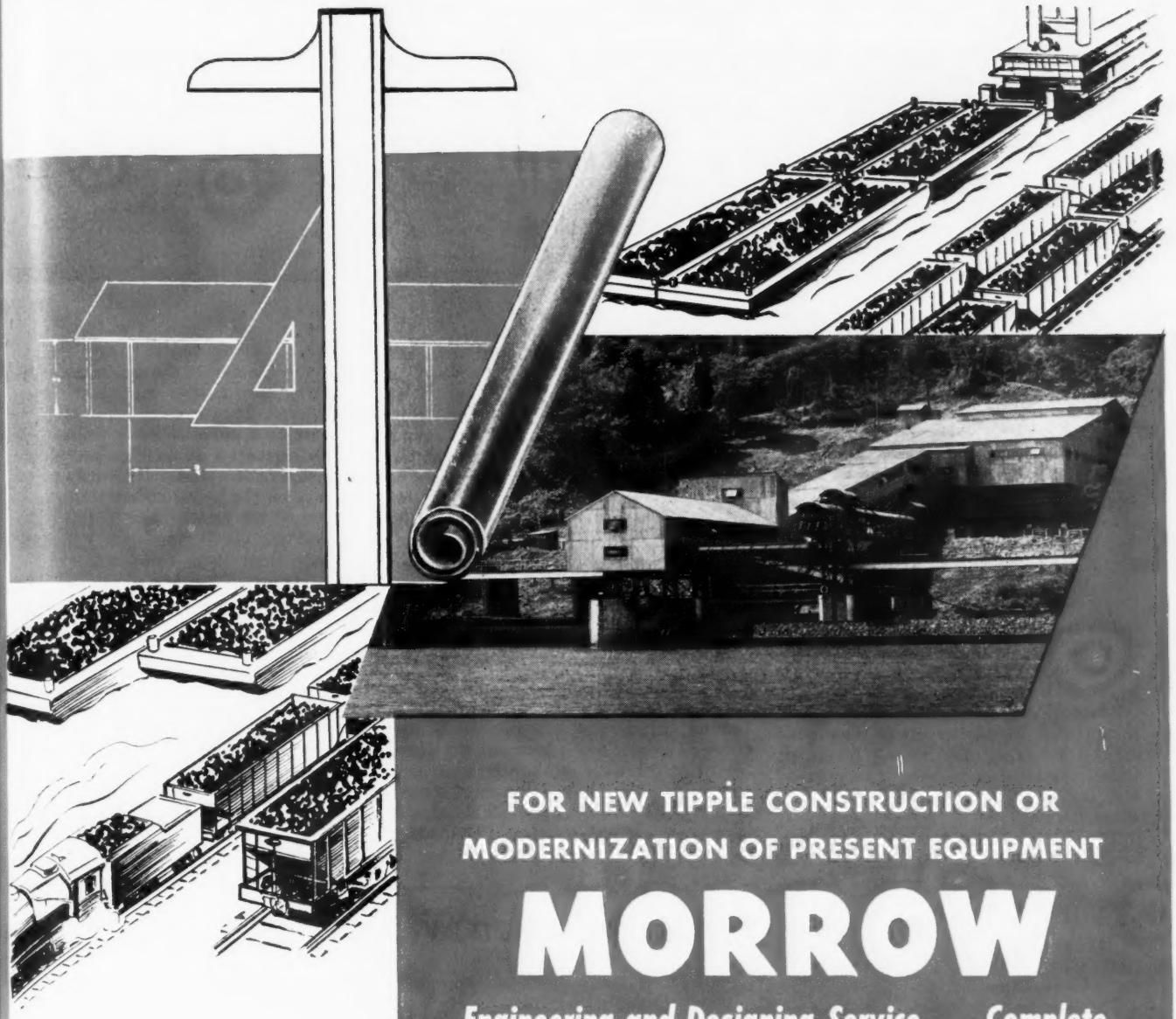
To Anneal Couplings, Chains and Drawbars

All metals consist of a large number of very small crystals, declares A. Preece, addressing the Yorkshire Branch, National Association of Colliery Managers, at Leeds University, England, recently. Its toughness and its ability to "give a little" without rupture and so take up stress and to resist, without cracking, stresses that are not axial are properties which depend to some extent on the size and arrangement of these crystals. This is one of the reasons why the properties of a cast metal are improved by hot forging which replaces the coarse columnar crystals with crystals of finer and stronger structure. Much of the variation in analysis in cast metal is removed during forging.

Consequently, Mr. Preece believes chains, couplings and drawbars during service should be periodically annealed so that they will maintain the necessary mechanical strength. Whether this is usual practice in Great Britain he did not say; apparently not. It does not seem to be done here.

Perhaps, the idea is worthy of consideration, in view of the dangers inherent in broken tractive elements in mine cars, especially with cars on mantrips and slopes. When the metal is being worked, it should not be held at or above the annealing temperature for a prolonged period or certain of the newly formed crystals will continue to grow at the expense of the others, resulting in a coarsely crystalline structure with consequent deterioration in mechanical strength. Blows on the heated iron distort its shape, but the crystals form anew automatically, and these crystals are not under strain, so the process does not make the iron hard or brittle.



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STATE-BOARD QUESTIONS

Mine Managers, Illinois

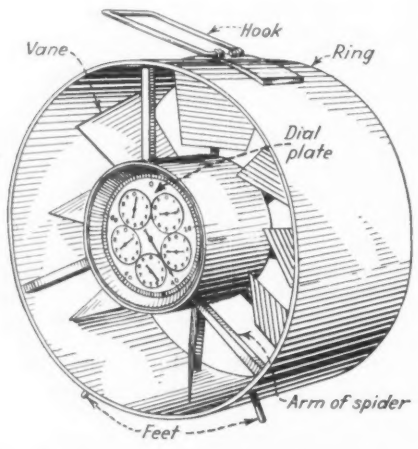
Q.—Describe an anemometer and say for what purpose it is used in the mines.

A.—Anemometer means a "wind measurer"—from the Greek *anemos*, wind, and *metron*, measure. It is an instrument originally used to measure wind velocity, but it has been modified for measuring the number of feet air travels per minute through a building or a mine. The type of instrument used in mine service is that known as the Biram anemometer.

As shown in the accompanying illustration, it consists of a light but broad band of metal, shaped like a ring or cylinder of about 4-in. diameter whereby is supported, by two spiders of three arms each, a revolving unit having blades or vanes, distantly resembling those on a disk fan, such as is used for ventilating mines.

The blades are inclined to the plane in which the fan stands so that when the air strikes them the fan revolves, the air escaping between the blades. The number of revolutions of the "fan" is recorded on the face of the dial by a train of gears (not visible) with dials to record the number of revolutions.

The instrument is so arranged that each revolution of the "fan" corresponds to one linear foot of travel. It will be noted that the air in this case drives the "fan" instead of the fan driving the air. To obtain a correct result in measuring the flow of air, the anemometer must be either held or suspended so that the rotating parts will revolve in a plane perpendicular to the direction of travel of the air current. A hook at the top of the ring is used to hold the instrument or for its suspension from another hook on a long stick. The feet on which it rests, as shown in the illustration, are provided solely to support the instrument when not in use. To rest it on these when taking the velocity of the air in the heading as a whole or even for a short distance above the floor would give an erroneously small result.



Anemometer measures air speed.

Q.—Which should be the larger in a mine, the inlet or the outlet airway, and why?

A.—Considering ventilation only, the return airway of a mine should have a larger cross-sectional area than the intake, because (1) more or less methane is generated in mines, which increases the quantity of air traveling in the return air current. (2) The air also becomes almost saturated with water vapor and so needs more space in which to travel. (3) Usually, the temperature of the return current is higher than that of the intake; this increases the volume of the return air, making it greater than that of the intake current. (4) As air flows from a point of higher pressure to a point of lower pressure, the return current is subject to less pressure than that of the intake. This reduction of pressure on the return airway increases the volume of the return current; this is true whether the fan is blowing or exhausting.

Aside from these considerations, however, where cars are hauled on the intake airway, as is usual in methanous mines, it may be necessary for practical reasons to make the intake road the larger. The loaded cars and empty trips passing to and fro on the haulage road obstruct the air flow. Moreover, a larger cross-sectional area should be provided so that a sufficient clearance space will be available at the side of the track for men and animals to pass the cars with safety. On the other hand, in a mine where coal and rock are hauled on the return airway, this airway should have the larger cross-sectional area.

Mine Foremen, West Virginia†

Q.—What is the purpose of check curtains? (Ventilation, 51).

A.—To deflect the air current from headings into working faces.

[Wherever the air, or an electric current for that matter, has a free choice of two or more paths, it travels both or all of them, but the longer paths, the detours, are not traversed by as much air or electricity as the shorter, unless the longer passages, in the case of air, are higher, wider, straighter or less obstructed. How much air will leave an unobstructed or uncurtained heading and enter into adjacent rooms is roughly calculable and depends on the height of the rooms (usually determined by the coal thickness), the width of the rooms and crosscuts and the degree to which they are filled with refuse and posts.

Air most emphatically does not travel only the straight and narrow path. Where the coal is thick, conditions are particularly favorable for the detouring of the mine air. We can assert of it that it has, where it splits, a definite pressure; and where it recombines, another definite pressure, and that this difference of pressure, which, in the formula $p = ksv^2 \div a$, is symbolized by p, actuates all the several streams of air—the straight streamlined current of the main heading as well as the detouring currents of the rooms with their irregular circuits. So we can be sure that, whatever that difference of pressure is, it acts equally on all currents traveling between the two splitting points. It will not be as great as if there were no opportunity for splitting, but its effect on all circuits is effective in accord with the formula quoted, with, however, one exception.

[The expression $sv^2 \div a$ is based purely on dimensions of space and on time but k is an uncertain factor that depends on the speed of the air and the roughness of the circuit (see *Coal Age*, July, 1934, p. 275). It is the resistance for one unit of rubbing area and for unit velocity divided by the area of cross-section and the whole equation assumes that this resistance always is proportionate to the square of the velocity. However, it is known that this is not true. Turbulent wind is more greatly resistant to travel than slow wind; it whirls around in miniature tornadoes and so travels further and generates much resistance. Part of the time it travels away from its ultimate goal, up or down or sidewise. Consequently it travels farther and uses up more of the pressure difference provided.

[We really do not know, but probably the value of k for the air in rooms is less than for the air in the heading despite its multiplicity of turns, its travel up into dead ends and its diversions through crosscuts. The nature of roof, floor and gob also are

† Continued from February, 1944, *Coal Age*.

One of two LeTourneau 33 heaped yard Carryall Scrapers, loading rooted shale with aid of pusher, stripped the first 20 feet of excess overburden in Weirton, W. Va., mine, to bring coal within profitable shovel reach. On smaller coal mining operations, LeTourneau Carryalls profitably handle all stripping.

21 WAYS TO INCREASE PRODUCTION

WITH LeTOURNEAU EQUIPMENT

You can save time and manpower by using cost-cutting LeTourneau Tournapulls, Carryalls, Dozers, Rooters and Cranes to handle these important mining jobs . . .

1. Clear stripping areas & roads
2. Pioneer side-hill cuts, benches
3. Strip overburden
4. Root rocky material, save blasting
5. Reclaim culm
6. Haul coal
7. Load cars, trucks by ramp
8. Stockpile coal
9. Build, maintain roads
10. Feed shovels, hoppers
11. Build runways, ramps
12. Build railroad grades
13. Shift tracks
14. Move spoil banks
15. Dig drainage ditches
16. Pit clean-up
17. Emergency slide, snow removal
18. Load, unload flatcars, trucks
19. Erect structural forms
20. Move machinery, supplies
21. Handle other heavy lifting and moving jobs.

To you, this ability of LeTourneau mining equipment to handle scores of stripping and materials handling jobs fast means more output per man . . . will help you increase production at lower tonnage costs.

Carryall—One-Man Stripping Rig

For example, LeTourneau Carryall Scrapers load, haul and spread in continuous operating cycles. One-man operated. Special loading and spreading tools are eliminated. Little supervision required to handle several Carryall rigs. Will work with tractors or with high-speed, rubber-tired Tournapulls, which further increase Carryall production by working at speeds up to 14.3 m.p.h., on longer hauls.

Extra Uses for Prime Mover Cut Costs

Other auxiliary LeTourneau tools —Tournacranes, Tournatrailers, Dozers and Rooters—are quickly and easily interchangeable . . . profitably extend Tournapull and tractor use over scores of other money-saving mining jobs.

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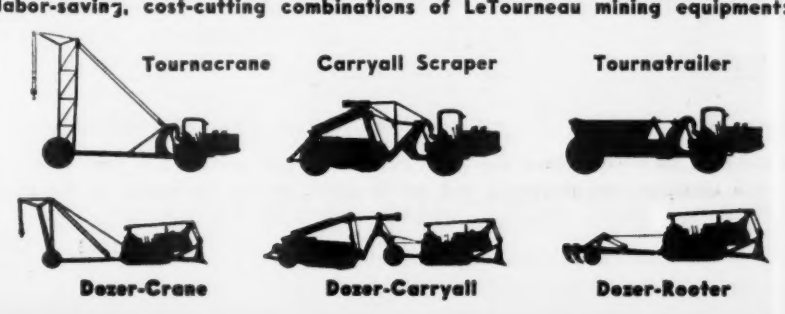
Commercial Fuel Co., Pittsburg, Kansas
R. L. Griggs, Hopedale, Ohio
Georgia Power Co., Bolton, Ga.
Hill & Suenders, Frackville, Pa.
Weirton Const. Co., Steubenville, O.
Truax-Traer Coal Co., Fiatt, Ill.
Canadian Colliery Ltd., Vancouver, B. C.
Sternberg Coal Corp., Booneville, Ind.
Bridy-Hanlon, Kulpmont, Pa.
General Electric Co., Buffalo, N. Y.
Shirley Gas & Coal Corp., Mahood, Pa.
Pittsburgh Coke & Iron Co., Pittsburgh, Pa.
Binkley Mining Co., Seeleyville, Ind.

. . . plan NOW to profit with LeTourneau high-speed, heavy-duty mining equipment on your postwar jobs. Our LeTourneau Field Engineering Department will gladly help you on special mining and planning problems. Write TODAY.

Cable control, with LeTourneau Power Control Units, makes possible these labor-saving, cost-cutting combinations of LeTourneau mining equipment:



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PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

Manufacturers of TOURNAPULLS*, DOZERS, CARRYALL* SCRAPERS, POWER CONTROL UNITS, ROOTERS*, SHEEP'S FOOT ROLLERS, TOURNAROPE*, TOURNATRAILERS*, TOURNACRANES*.

*Trade Mark Reg. U.S. Pat. Off.

factors, but the number of rooms also is a factor, for to detour perhaps 300 ft. and come back to the same heading demands more power on the air proportionately when making a quick return than when making a long one.

[Let us choose a few dimensions and consider two rooms both 300 ft. long at 50-ft. centers with necks 30 ft. long and 11 ft. wide. Let the rooms be 22 ft. wide and everywhere 6 ft. high. Only one crosscut is unbratticed—the last, and that is at the end of the two rooms. This crosscut also is 6 ft. high and is 11 ft. wide and 28 ft. long. A current of air in the heading under a difference of pressure p is free to go all the way to the end of one room, through the crosscut and back down the next room and out to the heading.

[Formula $p = ksv^2 \div a$ can be used for each part of the resistance to the progress of the air. Let us designate the speed of the air in the 270 ft. of the widened part of the room as V_1 Therefore, the resistance p will be, recognizing the fact that there are two rooms so that the distance has to be doubled:

$$k_1 \times 270 \times 2 \times (22 + 6)\ 2 \times V_1^2 \div 22 \times 6 = k_1 \times 229.0909\ V_1^2 \quad \ldots\ldots(1)$$

The volume of air passing through the crosscut and the necks will be the same as that passing along the rooms, but the speed will be different, and, as the crosscut and necks are half as wide as the rooms and equally high, the speed of the air will be twice, or $2V_1$ and the square of the speed will be $2 \times 2V_1^2$. The combined length of two necks and one crosscut will be $(2 \times 30) + 28 = 88$ ft. So their combined resistance will be

$$k_1 \times 88 \times (11+6)\,2 \times 2 \times 2\,V_1^2 \div (11 \times 6) = k_1 \times 181.33\ V_1^2 \quad \ldots\ldots(2)$$

Adding the resistance in the wide part of the rooms see (1)

$$k_1 \times (229.09 + 181.33)\ V_1^2 \quad (1)\ (2)$$
$$k_1 \times 410.42\ V_1^2 \quad \ldots\ldots(3)$$

[Taking the main heading as 10×6 ft., the resistance in traveling from the mouth of one room to the next will be:

$$k_2 \times 50 \times (10 + 6)\ 2 \times V_2^2 = 10 \times 6 = k_2 \times 26.67\ V_2^2 \quad \ldots\ldots(4)$$

As the differences of pressures or the total resistances are equal,

$$k_1 \times 410.42\ V_1^2 = k_2 \times 26.67\ V_2^2 \quad (3)\ (4)$$

Assuming that k has a uniform value regardless of speed and crookedness of path and that the effects of one cancel the effects of the other (which is a supposition not based on any calculation or knowledge):

$$410.42\ V_1^2 = 26.67\ V_2^2$$
$$\frac{V_1^2}{V_2^2} = \frac{26.67}{410.42} = 0.0644982$$
$$\frac{V_1}{V_2} = 0.2549 \quad \ldots\ldots(5)$$

Velocity in rooms is about one-fourth that in the heading.

[Now taking the same dimensions and figuring on six rooms instead of two, all driven up 300 ft. as in Fig. 2, with a crosscut at the end of each room (an unlikely proposition but one that would give about the same result as will be obtained if the rooms are in step and continue getting shorter with progress up to the heading as in Fig. 3. Considering the passage up the first room and the passage down the last excluding the two necks, p = as before $k_1 \times 229.0909 V_1^2$. See equation (1).

[As the air is channeled to a width of 11 ft. at every crosscut, it will be assumed that in crossing the room faces it will continue to force a channel 11 ft. wide across the face of every room, and it will be assumed also that there is as much resistance as if there was a coal face on each side of that channel, for passage against air results in as much or more turbulence than against coal. The total distance is 250 ft. but there are two necks to consider, so the distance is 310 ft. and p for this part of the travel =

$$k_1 \times 310 \times (11+6)\ 2 \times 2 \times 2\,V_1 \div (11 \times 6) = k_1 \times 638.7866\ V_1^2 \quad \ldots\ldots(6)$$

Totalling:

$$p = k_1 \times 229.0909\ V_1^2 + k_1 \times 638.7866\ V_1^2 = k_1 \times 867.8775\ V_1^2 \quad \ldots\ldots(7)$$

Considering the main heading

$$p = k_2 \times 250 \times (10 + 6)\ 2 \times V_2^2 \div (10 \times 6) = k_2 \times 133.3333\ V_2^2 \quad \ldots\ldots(8)$$

Cancelling the k's as before

$$867.8775\ V_1^2 = 133.3333\ V_2^2 \quad (7)\ (8)$$
$$\frac{V_1^2}{V_2^2} = \frac{133.3333}{867.8775} = 0.153631$$
$$\frac{V_1}{V_2} = 0.3919 \quad \ldots\ldots(9)$$

Velocity in rooms is nearly half the velocity in the heading under this condition.

[Data for a correct appraisement are not available, and some broad assumptions have been made which might not be found justified in practice, especially, if there are several open crosscuts short of the face to permit of shortened travel, but, as the room width is 2.2 times that of the heading, it is clear that the quantity in the rooms is a little less than that in the heading, if the rooms are not gobbed. The check curtain assures that with six or more rooms as high as the heading, the rooms will receive almost as much air as the heading would before the erection of the curtain. Such a curtain would be a more vital necessity with a thin seam of coal, with much gobbing in rooms, and a generous size of heading. Such a curtain should be made reasonably tight when the heading is not being used, though the heading at all times should have enough air to keep it free of methane.]

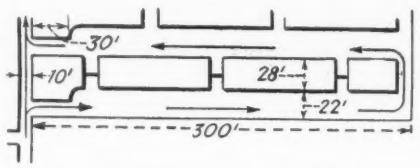


Fig. 1—Air detour ventilating two rooms.

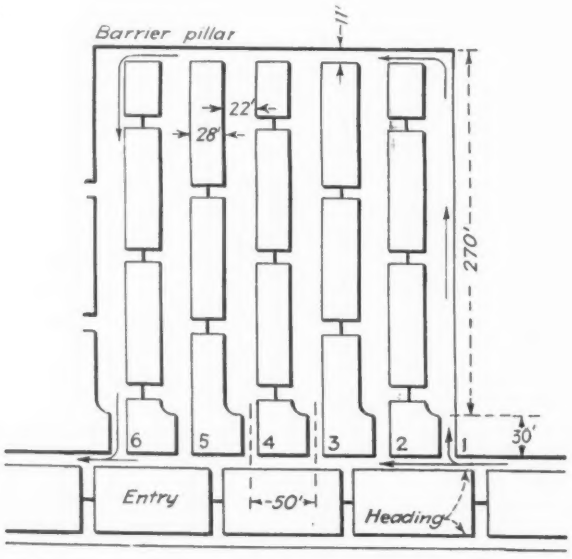


Fig. 2—Ventilating six full-length rooms by detour.

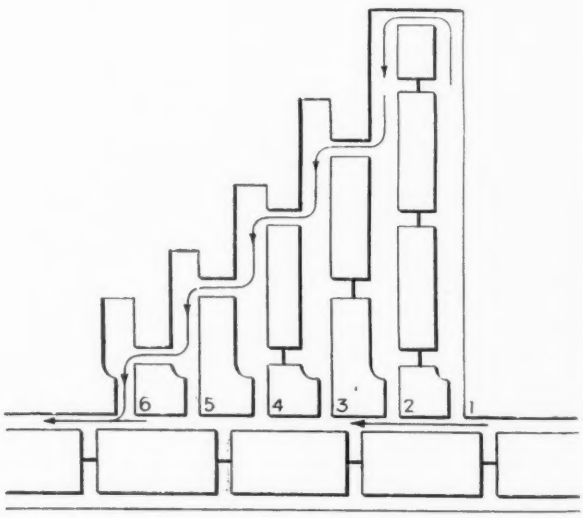
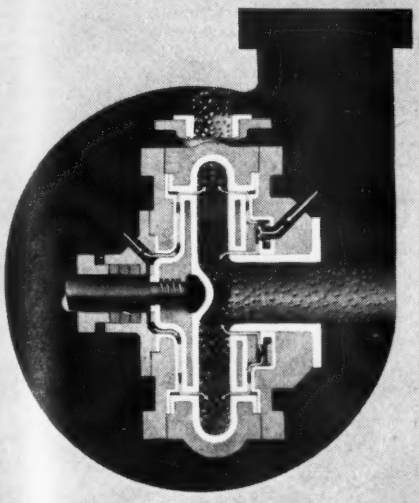


Fig. 3—Ventilating six stepped rooms by detour.

Crosscuts do not permit of any lengthier detour than six rooms where the room current always travels the next outby crosscut and in no case reenters any rooms and when crosscuts are staggered and set at 100-ft. centers as shown in the illustration.

"The Fountain of Perpetual Youth" in Abrasive Pumping



This "Perpetual Youth" that the Spanish Explorer, Ponce de León, sought in Florida, you can obtain in pumping of abrasives, by means of a Hydroseal Pump. The principle of sealing each side of the impeller with clear water prevents leakage to suction or stuffing box (see diagram above) and hence develops high pumping efficiency and low maintenance. But, in combination with Maximix Rubber Parts (see white in diagram at left) maintenance is still further reduced, as rubber generally outlasts metal "four to six times." Hydrosealing keeps the pump at substantially its "when new" efficiency until the Maximix finally wears out. Then, the Maximix lined parts can be replaced in a matter of minutes at very low cost. All this is completely explained in our Catalog No. 140. Write for it.

HYDROSEAL ABRASIVES AND CORROSIVES MATERIALS HANDLING PUMP

THE ALLEN-SHERMAN-HOFF CO., 231 S. 15th Street, Philadelphia 2, Pa.

Offices or Representatives in most Principal Cities

TIMELY OPERATING IDEAS

Welding Jig Speeds Repair Work

AN ADJUSTABLE fabricated welding jig for repairing mining-machine shafts and disks has been built by A. D. Weaver, Joy mechanic, No. 2 mine, Bell & Zoller Coal & Mining Co., Zeigler, Ill.

"The accompanying photograph shows a stand we built to hold parts such as cutting-machine and Joy loading machine parts while they are being built up by electric welding. It is used chiefly for holding shafts and disks. The stand allows the material to be turned around by hand with very little effort, and without fear of the operator being hurt.

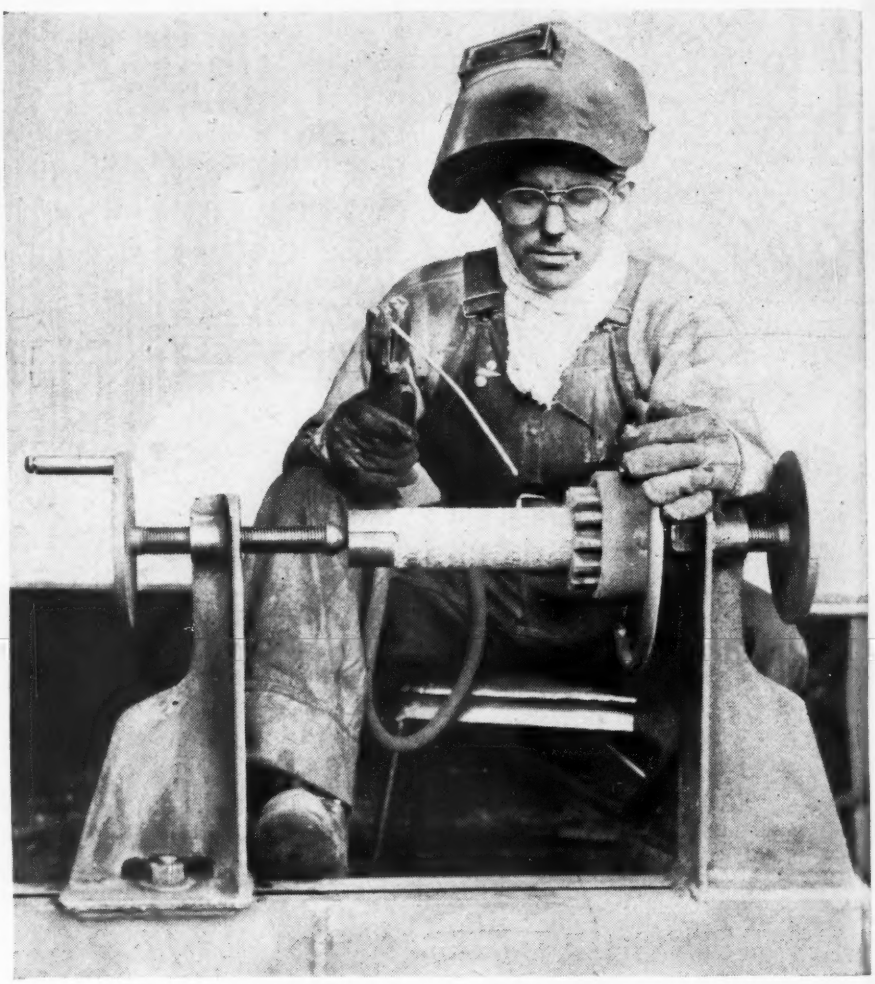
"Some of the standard parts we have used it on are:

Joy 11-BU swivel arms
Joy 11-BU disks
Joy 11-BU rear conveyor shafts
Joy 5-BU rear conveyor shafts
Joy 11-BU food shafts
Jeffrey 35-BB pinion and vertical shafts

"To make the jig, we used the following:

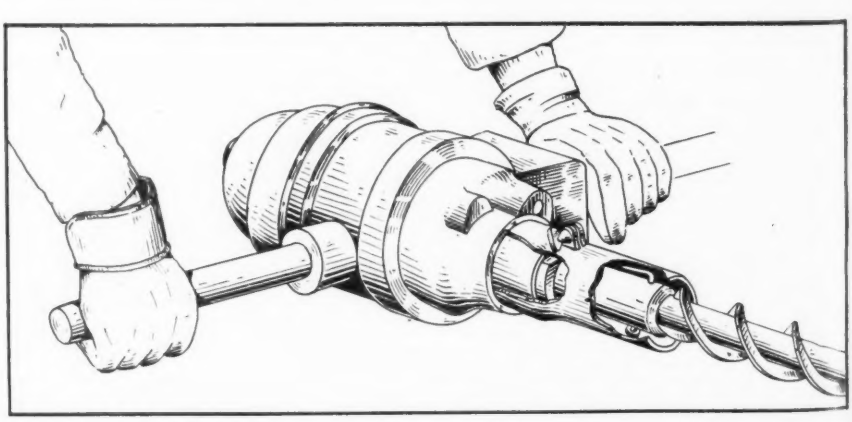
2 pieces—4-in. channel iron, 4 ft. long
1 piece —7-in. channel iron, 4 ft. long
2 pieces—12-in. I-beam, 16 in. long
2 pieces—8x12-in. plates
2 pieces—1¼-in.-dia. by 10-in.-long round iron rod, threaded for adjusting to the different size parts
2 pieces—10-in.-dia. circular disks with crank handles
2 pieces—½-in. pipe, 4-in. long
2 pieces—½x5-in. rivets for disk handles

"In making up the stand," says Mr. Weaver, the two 4-in. channels are used inside to inside, and the adjusting bolt which holds the upright, slides between the channels."



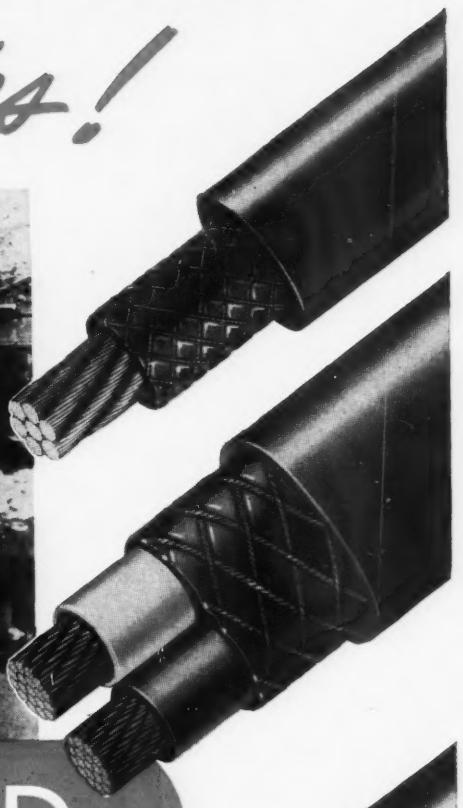
Guard Designed For Drill Chuck

A SAFETY GUARD, to protect a drill operator against possible injury when a pin or nail is used to secure the bit to the revolving chuck, has been designed by Karl T. Miller, safety inspector, Loree Colliery, Hudson Coal Co., Scranton, Pa. A description recently appeared in The Hudson Coal Co. *Safety Commutator*. The details are shown in the accompanying illustration.



How drill housing guards are made and applied.

HONOR GRADUATES OF THE SCHOOL OF *hard knocks!*



AMERCLAD

will give you long, dependable service under tough working conditions

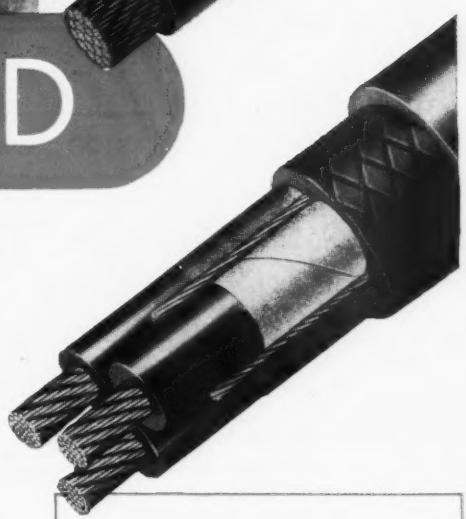
IN this kind of service — where portable power cables are subjected to every kind of abuse—dragged over rough and rocky ground, hauled through water, grease and mud, stepped on, run over and heartlessly exposed to every change of weather, AMERCLAD really shows how much stamina and endurance can be built into a cable.

Designed and constructed to deliver an uninterrupted flow of power, AMERCLAD Portable Power Cables meet every requirement of the wartime speed up.

AMERCLAD Low Voltage Cables are flexible to permit continual reeling and unreeling, yet are sufficiently tough and rugged to withstand severe usage of all kinds. They are designed to operate satisfactorily under heavy overloads and attendant high temperatures. Their resistance to water, oil and acids is a further aid to long service.

AMERCLAD High Voltage Cables provide high impulse strength plus flexibility without danger of corona cutting so that when operated with suitable line protection they insure continuity of service and freedom from breakdown.

Even now, when crude rubber is not available and the use of Neoprene is greatly restricted, we have developed synthetic rubber compounds for use in Amerclad Cables that carry on the old tradition of trouble-free service. To save time and money, use AMERCLAD.



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Aerial Tramways
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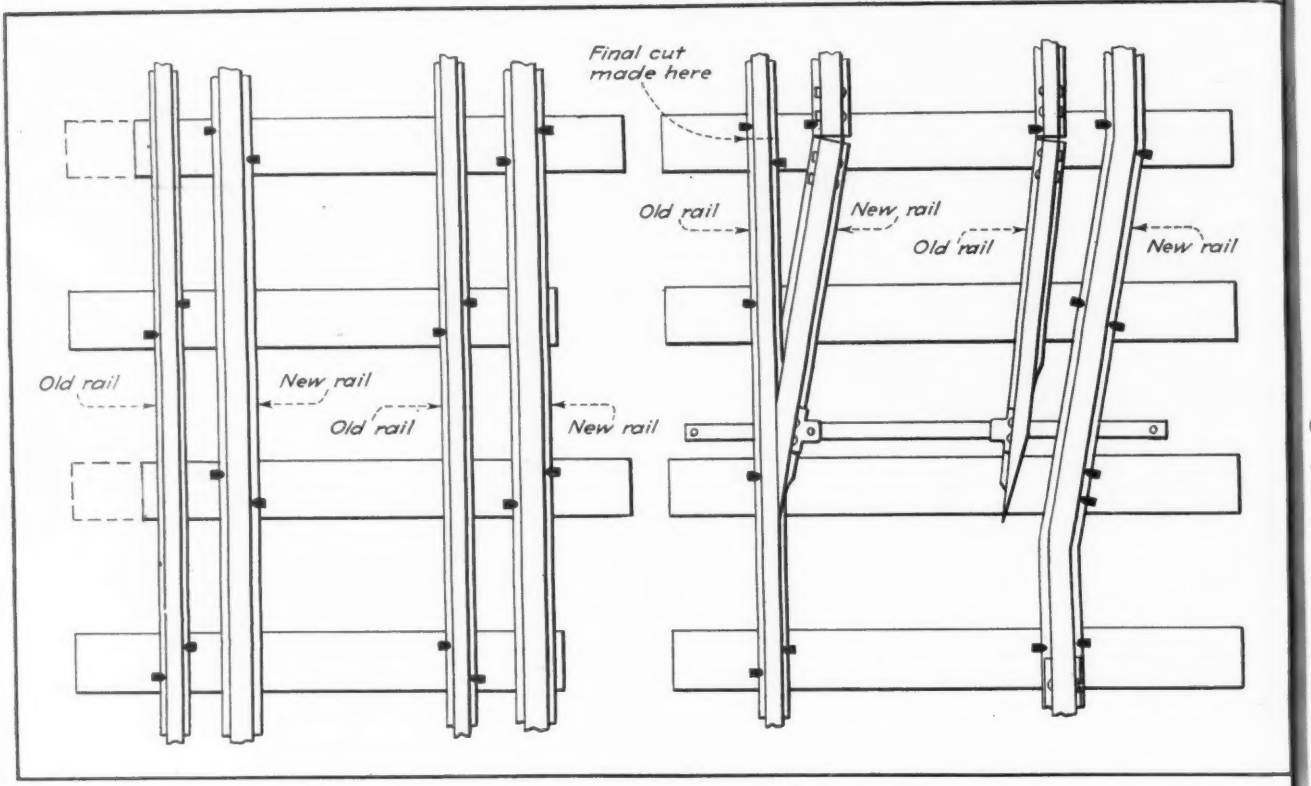
UNITED STATES STEEL

New Steel Laid Without Interrupting Traffic



Method used to lay and connect new steel with old track.

THE PROBLEM of changing steel rails on considerable stretches of track where it is neither desirable nor practical to suspend traffic was solved by laying new steel in an offset position, writes Edward Fellabaum, Powhatan Mining Co., Powhatan Point, Ohio.

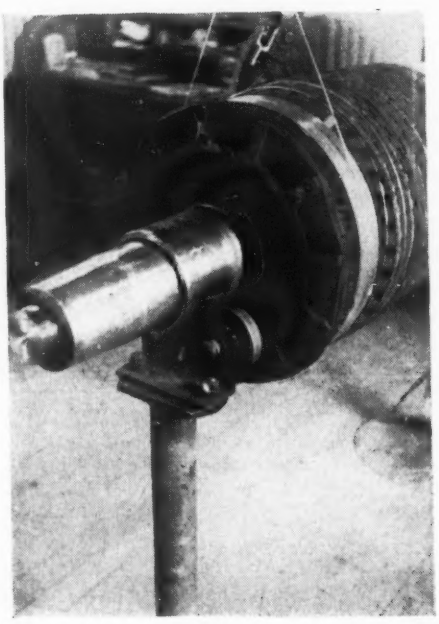
"This can be done with speed and economy by pulling the spikes from every second crosstie and sliding it out about 12 in. (depending on weight of rail involved)," as shown in the accompanying illustration. New steel is strung alongside the old steel, spliced together and spiked to gage on the ties so moved. If new ties are required they are put between the old.

"After the new track is prepared in this manner it may be 'cut in' at both ends, the old rail removed and the balance of the ties spiked, whereupon the new track may be aligned and graded when convenient without any interruption to traffic."

This method of installing new rail, says Mr. Fellabaum, has been used "for both heavy and light rail, with wood or steel ties. Although the idea was born of necessity, we find that we can put down just as much track and with less heavy work than with the orthodox method, incredible as it may sound."

Frictionless Armature Stands

THIS IS THE DAY of wearing things out and then giving them another job. A case in point is the frictionless armature stand shown in the accompanying illustration, an idea of John H. LaGrand, chief electrician, the Mackie-Clemens Fuel Co., Pittsburg, Kan. How efficient these worn-out ball bearings are for rolling the armature in the process of banding can be appreciated only by doing the job. An armature resting on such a frictionless support (providing the bearings are not worn too badly) might also be given a static balance test. The effect of extra solder (for balancing) at some point on the band can be quickly observed.



Pass It On!

You have an idea working at your mine which has paid for itself many times over—perhaps the initial cost was only a little time and trouble. How about doing the industry a good turn by passing it along to others? Coal Age stands ready to help you pass along that workable idea—whether it be mechanical, electrical, operating or safety. Mail it in—with a sketch or photo if it will make it clearer. For each acceptable idea, Coal Age will pay $5 or more on publication.

INVASION *and the* FINAL CHALLENGE

The idea that our national security some day would depend upon the successful invasion of continental Europe by our armed forces was inconceivable to the average American but a few short years ago. Yet, today our whole strength is assembled to that very action and for assuring a sound and permanent peace.

America became great without aggression . . . without tyranny. Our greatness has been achieved without destroying others . . . ours is a history of unprecedented industrial progress, of development of our own resources and reliance on our own efforts.

Aggression is foreign to American philosophy. Yet, today we find ourselves faced with the choice of destroying or being destroyed. Today we are confronted by the hard fact that the kind of peace which we all so fervently desire can be achieved only by crushing autocracy and by removing the causes of aggression.

We are now engaged in the accomplishment of the first objective. Since Pearl Harbor a complacent, peace-loving America—the largest of the "soft" and "decadent" democracies—has grown strong and tough. Out of the inherent virility of a free people we have moulded the mightiest force for invasion and attack that the world has ever seen.

We have reached our peak rates of war production. We are producing as much war equipment as all the rest of the world combined.

History will record our industrial mobilization as a phenomenal achievement.

The battle of production has been won!

The full might of our armed forces and those of our allies unleashed against the Axis war machine will bring eventual victory. Two and a half years of intensive preparation, backed by 168 years of growth as a free nation, has given us superiority over twenty years of painstaking preparation by the totalitarian and militaristic countries with their enslaved peoples.

Every American has contributed toward this powerful offensive. Our manufacturers and business leaders have exerted their fullest efforts. Our industries have mobilized their tremendous resources—tapped to the fullest degree their inventive and productive genius. The men and women in the factories, on the farms, and in the mills and mines have played a magnificent

part in the tremendous production program. Citizens all are making their contribution to the armed victory that lies ahead

We have demonstrated that a free people under a free enterprise economy can unite in a common purpose.

* * *

When the war is won, we shall be faced by our second objective . . . removing the causes of aggression. This is a social challenge. A challenge to those who would sacrifice our democratic way of life for personal gains or foreign ideologies.

The best insurance for the continuance of our democracy is a successful democracy. That means a dynamic and not a static democracy. All of us who want to preserve the ideals that have made America . . . and that includes all but a handful of extremists . . . must determine to find the policies and programs which will permit us to make the most of the abundance nature has provided for us.

To achieve this end we must recognize the fact that we are but a wheel in the machinery of world economy. A wheel that must drive or be driven. A wheel that must mesh smoothly with the many other wheels or be stripped of its cogs.

We are the only nation on earth free enough and strong enough to shape the mould of its own destiny. We can be hampered by nothing but our own confusion.

* * *

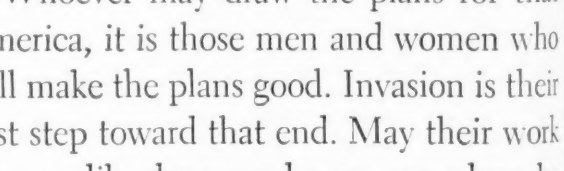
The mind and the heart of all America today brood over the shores of Britain and watch over the narrow waters that wash the beaches of the Continent. And the prayers of all America go with each of those who embark upon that epic passage.

Those of us at home who are producing the fighting tools and who are so earnestly concerned with the problems that will face a postwar America, should see now, even if we may never have seen it before, that all our plans will be worth just exactly what the men and women who make that passage are prepared, competent, and inspired by their leadership to make them worth.

For those men and women are America!

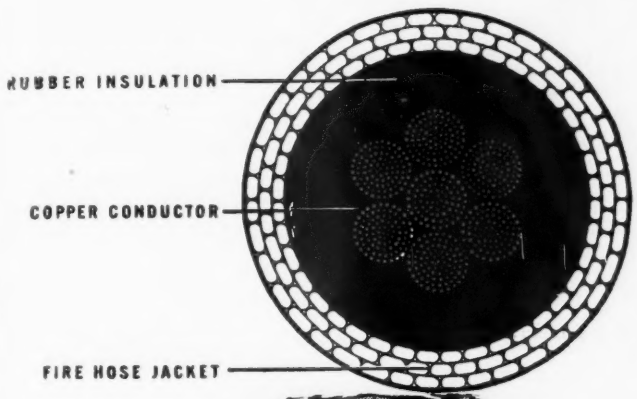
They have gone out from rich homes and poor homes alike, from farms and factories, from schools and churches, from mines and ranches, from offices and studios, to take their places in the battle line. They are a cross-section of the America that is to be.

Whoever may draw the plans for that America, it is those men and women who will make the plans good. Invasion is their first step toward that end. May their work be speedily done, and may our plans be worthy of that work.



President, McGraw-Hill Publishing Company, Inc.

Duracord helps two ways...



1. Saves up to 50% rubber in mining cable

2. Saves down-time losses in vital mine production

THERE is nothing "ersatz" about Duracord*; it is a cable construction developed during the last war to meet the need for heavy-duty cords and cables . . . a need it is *currently* filling not only in mines but also industrial plants and shipyards.

The Duracord covering is woven like a fire hose—*not braided.* This tough yet flexible cover replaces the rubber jacket on all-rubber cords making possible rubber savings as high as 50%.

For further information, please send us your inquiries.

SUNEX SECURITYFLEX* TO WAR

This well-known all-rubber companion to Duracord has been preempted for the toughest kind of jobs in the war effort where all-rubber cord is mandatory. Until peace, its use will be strictly regulated. 42284

*Reg. U.S. Pat. Off.

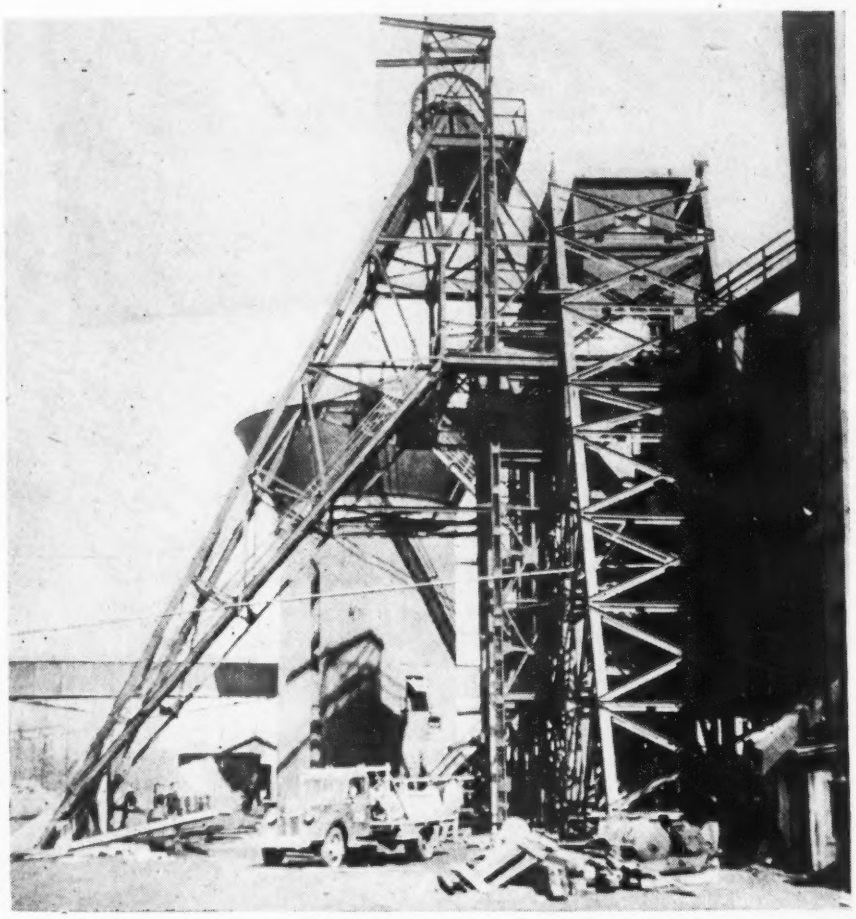
Two marks of achievement — the cherished Navy "E" (awarded to two of our plants) for achievement in production...The Anaconda trade-mark for achievement in quality.

ANACONDA WIRE & CABLE COMPANY
Subsidiary of Anaconda Copper Mining Co.
General Offices: 25 Broadway, New York, 4
Chicago Office: 20 North Wacker Drive, 6
Sales Offices in Principal Cities

Sunex Securityflex and Duracord

ANACONDA WIRE & CABLE COMPANY

Leaning Tipple Righted Again



Job practically completed. At the right is the double "A" frame with two of the hydraulic jacks still standing at the top. The tipple has been suspended from the "A" frame, which now carries most of the weight. All that was left to do when this picture was taken Sunday noon was a little finishing work on the guides and cleaning up.

RIGHTING the leaning tipple was a recent job at Majestic No. 14 Mine, Peabody Coal Co., Duquoin, Ill., under the supervision of William Reuter, construction superintendent.

Many early tipples were built straight up from the timber or concrete shaft lining, depending on them in part for foundation support. Subjected to this extra weight, shaft casings often gave way and permitted the tipple to settle out of line. The strains thus set up in the steel bracing caused the failure of individual members by bending, crimping and breaking.

Another feature of early steel tipples that encouraged failure was the fabrication of compression members of fragile lattice work. The thin braces had little material to resist rusting and the intricate construction made protective painting difficult. As a result, this type of construction rusted readily, weakening the structure to the point of failure under the stresses set up as foundations gave way.

These several conditions speeded the settling, and consequently the failure of some of the braces, of the steel tipple at Majestic No. 14. The method of lifting and realigning this tipple, and transferring the weight from the shaft to points at a safe distance away offers food for thought at other operations with similar difficulties.

This tipple did not settle evenly. They seldom do. The foundations for the back braces, 40 or 50 ft. from the shaft, did not settle at all. The uneven settling of other parts of the structure broke some braces, bent and crimped others, broke splice plates and tilted the tipple much out of plumb. Its precarious condition made it necessary to raise the whole structure to its original level and renew broken parts.

Fortunately, the shaking-screen structure is independent of the tipple, but they overlapped about 15 ft. The basic idea in realigning the tipple included additional permanent foundations and auxiliary supports to take the weight from the shaft area.

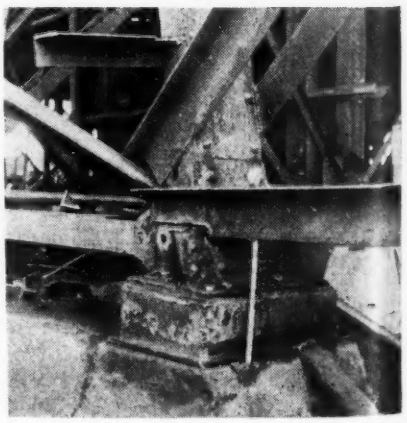
Four new concrete foundations were poured, each with 100 sq.ft. of footing area. What might be called a double "A" frame, made of steel, was set astride that section of the tipple that overlapped the screen structure. The four legs were each made from two heavy 12-in. channels with legs turned in and tied together with solid plates 12. in. wide. These legs were braced with angles and tied together at the top with plate girders 36. in. deep. The entire structure is arc-welded.

Eight 50-ton hydraulic jacks were used to raise the tipple and level it. One jack was set at each corner on top of the double "A" frame. Steel rods were dropped from cap plates over the jacks to tipple members and welded. The other four jacks were set at strategic points on the ground. By that arrangement the tipple was half lifted and half pushed up. That also overcame any tendency to become top heavy. About four hours was required to raise the tipple, one point of which had settled 13 in.

Permanent hangers then were welded to the tipple proper and the "A" frame structure, which has now become an integral part of the tipple and serves to carry most of the weight. As an aid to carrying the weight, but mainly to steady the bottom end of the tipple legs, shims varying from 2 to 13 in. in thickness were set at key points on the original foundation. These shims are box-shaped, welded up of flat plates, and having thicknesses to compensate for the amount of settling at the various points.

This job of rehabilitation was done between quitting time Friday afternoon and work time Monday morning, including removal of the cages and replacing them. The "A" frame and the other preparatory work had been done on several previous week ends.

A 13-in. shim under the tipple brace on the north side of the shaft. Break in the concrete foundation is plainly visible. This was the point of maximum settling.

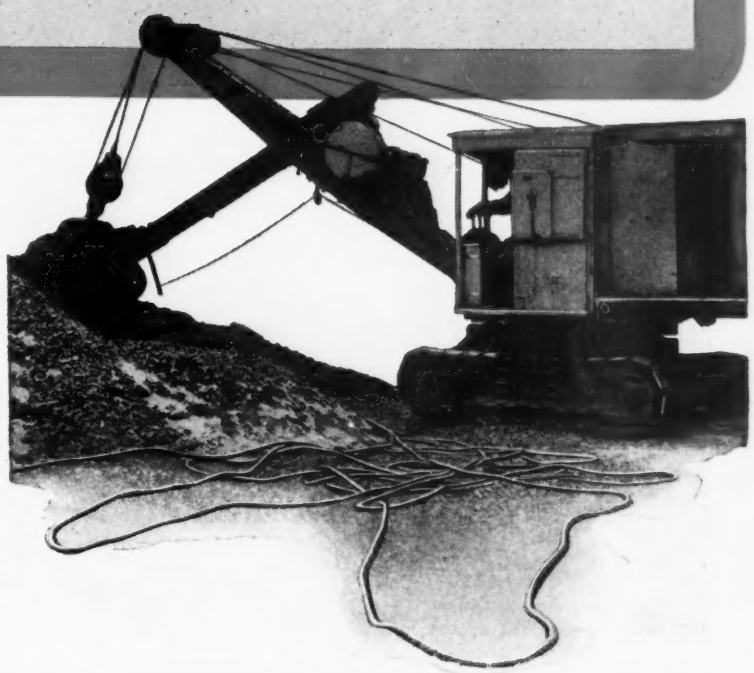


A 7-in. shim under the south tipple brace.

OKOCORD

ELECTRIC SHOVEL and DREDGE CABLE

Rugged and Durable

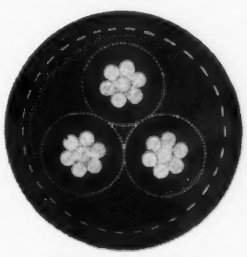


Okocord electric Shovel and Dredge cables are built to withstand tough treatment. Dragging over the sharp edges of shale and rock, exposure to extremes of weather are milder forms of punishment. Okocord cables have established outstanding records for long life in strip-mining, construction jobs, dredging and other quarrying operations. They don't have to be coaxed or pampered.

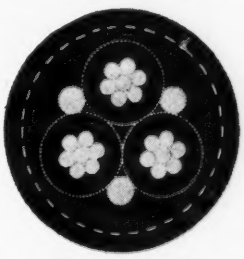
Okocord portable power cables — sizes 8AWG to 500,000 CM, single or multiple conductor — are available for service up to 15,000 volts in the following designs:

Type	Ground Wire	Shielding	Location of Shielding	Operating Voltage*
W	None	None	.....	0-2500 V.
G	Yes	None	.....	0-4500 V.
SH-A	None	Yes	Over each conductor	Over 2000 V.
SH-B	None	Yes	Over assembled conductors	2000-7000 V.
SH-C	Yes	Yes	Over assembled conductors	2000-7000 V.
SH-D	Yes	Yes	Over each conductor	Over 2000 V.

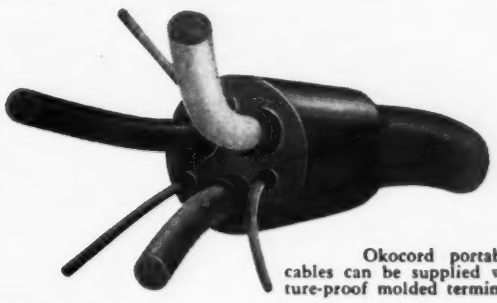
*The above voltages are the recommended, though not necessarily the limiting, voltage for each classification.



Type W Okocord without ground wires.



Type G Okocord with ground wires.



Okocord portable power cables can be supplied with moisture-proof molded terminals.

OKONITE

PASSAIC OKONITE SINCE 1878 NEW JERSEY

3581 INSULATED WIRES AND CABLES

Modern Mines Require Many Portable Instruments

Some of the Isabella instruments.

MAINTENANCE of the most profitable type —preventive maintenance—requires knowledge, experience, systematic procedure and tools for detecting conditions not apparent to the eye. The easiest of the three to attain, at least during normal times, are the tools, yet at many large mines the maintenance men are hampered by a lack of these electrical and mechanical testing instruments. That does not seem to be true, however, at the Isabella (Pa.) mine of the Weirton Coal Co., where mobile loaders and all equipment inside and a large cleaning plant outside are working three shifts per day six days per week. In a small separate room in the main underground shop and in the electrician's shop on the outside are kept the following electrical and mechanical instruments:

Portable Instruments Ordinarily Kept Underground

Recording ammeter, 50 millivolts, d.c., General Electric, Type CD-12, Model 8CD12ABA6.

Recording voltmeter (300 volts d.c., cycles 0-60, volts 300/550, General Electric, Type CD-14, Model 8CD14VAB5.

Cathode-ray oscillograph for use on ignitron rectifiers, Radio Corp. of America.

Ammeter, 50-millivolt Westinghouse Type PX-5, Style PG-32495-2, complete with the following shunts: 500-amp., 1,500 amp. and 3,000 amp.

Voltmeter, double-range, 150/300 volts, Westinghouse Type PX-4.

Voltmeter, double-range, a.c., 150/600 volts, Westinghouse Type PY-5.

Industrial analyzer, d.c., Westinghouse Type TX.

Field polarity tester, 0-10 milliampere, General Electric, Type DO-41, Model 8-DO-41-AAM7.

Field and armature tester, a.c., 110-220-440 volts, Martindale No. 2.

Tachometer, three ranges of r.p.m.: 300-1,200, 1,000-4,000, 3,000-12,000; Herman Sticht Co. Model J.

Tong testers (two of them), 50 to 500 amp., Martindale.

Blasting circuit test meter, Dupont.

Meg-o-meter, 0.05 to 100 megohms; Superior Instrument Co.

Ohmmeter, 0.5 to 50,000 ohms; Martindale R. & S.

Megger testing set, 4-10,000 megohms at 2,500 volts, 0.25-2,500 megohms at 625 volts; J. G. Biddle Co.

Volt and bond tester combination, Mosebach.

Electric etcher, 110 volts, Martindale.

Portable Instruments Ordinarily Kept Outside

Graphic wattmeter, a.c. and d.c.; Esterline-Angus Model AW.

Voltmeter, d.c., 0-750; Westinghouse.

Junior multimeter, Superior Instrument Co.

Industrial analyzer, a.c.; Westinghouse Type TA, Style 836800E.

Tachometer, four ranges covering 60 to 8,000 r.p.m., Martindale.

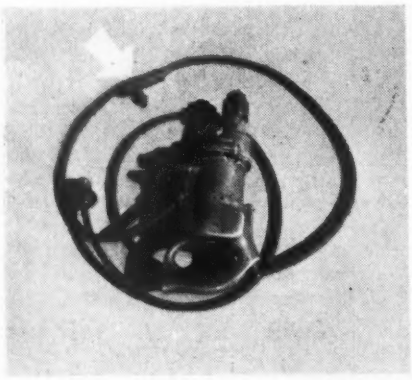
Tong ammeter, a.c. and d.c., 0-50, 0-200, 0-400; Martindale Type AX.

Voltage tester, Wiggington.

Telephone test set, Western Electric.

Universal current transformers (two) 2,300/4,600-115 volts, General Electric Type JE-9, Model 9DAS1.

Taping to Power Line Keeps Chuck Key Safe



In sight when needed

SHOP ITEMS like tiny drill bits, gages, keys and the like are easily lost from one's pocket or mislaid around the shop. Sometimes when badly needed they are hard to find. For example, it would be difficult to find a substitute for a chuck key to a small portable drill. The personnel of the electric shop at the Sahara Coal Co.'s strip mine, Harrisburg, Ill., however, devised a way to keep the chuck key of a small portage hand drill right on the job when needed. It is taped to the rubber cord that supplies power to the drill. Hence it is never in the way and never gets away.

A Statement of Policy By

POWDER NATIONAL COMPANY

— A NEW COMPANY WITH *Fresh Ideas!*

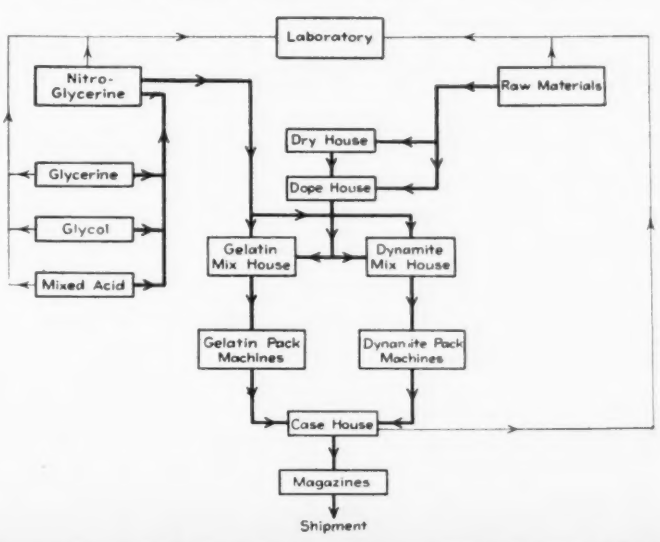
The phenomenal growth of National Powder Company (more than 38,000,000 pounds of powder sold since 1936) is due to a few simple factors:

1. **Absolute control in manufacturing.**
2. **The right explosive on the job.**
3. **Fresh explosives—the minimum of intermediate storage.**
4. **Being sensible to our commitments and living up to them.**

Starting manufacturing in 1937, "National" explosives every day are and have been bought by an increasing number of users on construction work, demolition, coal and metal mining, and in the quarries and mines of the non-metallic industry.

NOT LIVING ON OUR REPUTATION BUT BUILDING IT

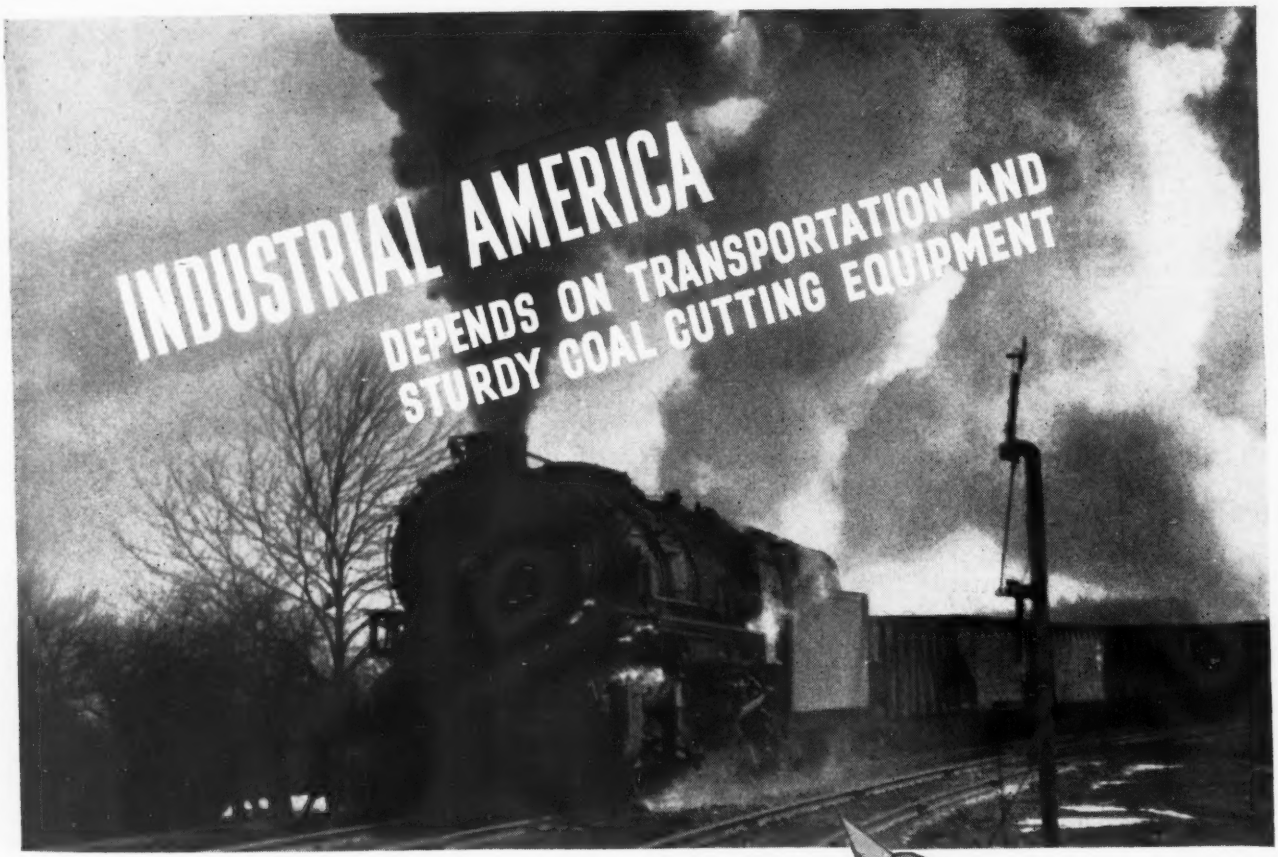
A FLOW SHEET FOR MANUFACTURING HIGH EXPLOSIVES



NATIONAL POWDER COMPANY

ELDRED (McKean County), PENNA.

MANUFACTURERS OF HIGH EXPLOSIVES FOR ALL INDUSTRIAL PURPOSES



CINCINNATI

CHAINS *and* BITS

DUPLEX BIT

CINCINNATI DUPLEX CHAIN

STEP UP TONNAGE..DECREASE COSTS

AGAIN this year, the Coal Mining Industry has been called upon for Increased Tonnage. Cincinnati sturdy, long life, well engineered Chains and reversible double-ended Duplex Bits will help you produce that extra tonnage. Cincinnati Chains, Bits and Bars top them all for trouble-free performance . . . for greater production and economy. Heat treated and drop forged, Cincinnati Coal Cutting Equipment is designed and engineered to use less power . . . to give larger cuttings . . . to reduce maintenance and hold shut-downs to a minimum.

Hardened Eccentric Pin is designed so it can't turn in block . . . placing joint wear between pin and insert.

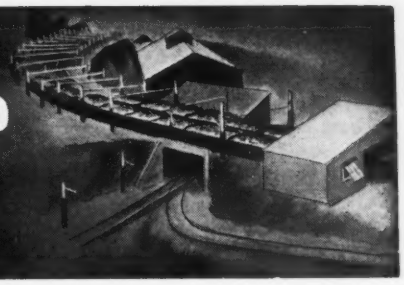
Bearing Pin is held against longitudinal displacement by this easily removed, alloy steel, heat treated Rivet.

Long life, replaceable, hardened alloy steel Connector Insert gives new factory joint accuracy to a worn connector.

THE CINCINNATI MINE MACHINERY CO.

2983 SPRING GROVE AVENUE • CINCINNATI, OHIO

COAL AGE NEWS ROUND-UP



Manpower in Coal Grows More Critical

Coal's manpower problem, steadily growing tighter, was precipitated into an even more critical condition by the order of Maj. Gen. Lewis B. Hershey, director of Selective Service, April 8, that draft boards proceed with processing of men aged 18 to 25. At the same time, induction calls on those of 26 or over were suspended. While coal originally was subjected to the full effects of the order for inducting young men, representations by the industry and government agencies directly concerned resulted in inclusion of coal in one of 13 critical industries as to manpower and special deferment of certain young men in certain coal-producing areas.

Discussing the proposal to induct all able men between 22 and 25 without respect to their occupation, Dr. Potter, addressing the 25th annual meeting of the New York State Solid Fuel Merchants' Association, April 11, in New York City, said the coal industry now has approximately 36,000 workers under 26 years of age, in whom the armed forces are particularly interested immediately. These men, he said, represent on an average basis an annual production of 50,000,000 tons of coal. Of these men, some 7,000 probably would be lost to coal in the opinion of some authorities.

Employment in bituminous coal mining, according to a review of the situation made for Paul V. McNutt, War Manpower Commission chairman, declined from 389,000 in January to 385,500 on March 1.

90-Day Respite for 18–25

In response to Mr. McNutt's request that something be done about coal miners under 26, General Hershey sent telegrams April 11 to State Selective Service directors having jurisdiction over Pennsylvania, West Virginia, Virginia, Alabama, Washington, Tennessee, eastern Kentucky and southern Wyoming authorizing 90 days' deferment from May 1 of coal-mining registrants aged 22 to 25 having three or more years of coal-mining experience. Those under 22, according to the instructions, were to be subject to the general draft of men under 26.

While temporary deferment of some of the younger and more productive men will be of considerable help, the manpower situation was regarded as critical both in Washington and in the industry. Emphasizing this, WMC continued to press a nation-wide search, beginning April 1, for 40,000 ex-miners willing to go back to work in coal mines. The search is to be conducted through newspapers, radio, personal letters and through government agents. It was stated that miners' unions would cooperate in getting former members who had taken other jobs and old timers who had retired to return and that the U. S. Employment Service would comb various war plants for one-time miners.

WMC reported April 20 that the U. S. Employment Service is playing a large and increasing role in recruiting for the coal mines. The proportion of placements to total accessions increased from 43.7 percent in November to 46.5 percent in February. In the critical western mines, two out of every three new workers are now USES placements.

RENEW PROMPTLY

Please don't put off renewing your subscription to Coal Age. If you delay too long all we can do is put your name on the waiting list, where it may be months before it comes up. And even when your name does come up we shall not be able to supply missing copies for your file. Paper is extremely short due to war conditions. Like all other publications, we have had two cuts in paper supplies and are operating under a fixed allotment. We have not cut editorial content nor have we reduced the number of subscribers. We froze our circulation at the current figure and now, as new subscriptions come in, cut off subscriptions promptly on expiration—not, however, without giving each subscriber ample opportunity to renew. We would much rather serve old subscribers than new ones if it were a matter of choice. Please renew promptly.

Coal Distribution Controls Tightened

Imminence of opening of the second military front in Europe, with resultant tightening of the manpower problem, is complicating an already critical fuel situation. Allocations are being cut to meet the situation and industries have been advised to add to storage piles early and continuously. Because of scarcity of domestic fuels in the Southeast, consumers of such fuels in other areas have been notified that it will be necessary to obtain 25 percent of their needs locally where possible. Efforts are being made to regularize monthly shipments.

Industries Urged to Store Coal—Industrial consumers of coal, particularly war plants, are urged by Donald M. Nelson, WPB chairman, to buy and store maximum quantities of coal during the coming months in anticipation of a serious deficit in supply for the coming year. He says the prospects are far more serious than in the preceding three years, as SFA forecasts a deficit of at least 25,000,000 tons—perhaps even 45,000,000 tons if manpower in the mines is seriously diminished by draft requirements.

District 3 Prices Revised—OPA price revisions in northern West Virginia, announced April 18, reduce size groupings from ten to five; railroad fuel and all commercial shipments by rail are combined in one schedule, and price relationships are improved as between sizes of coal. Commercial mine-run price ceilings have been reduced 5c. per ton, most slack ceilings have been increased 5c. and adjustments have been made in ceilings for small double-screened coals in several price classifications. These actions were taken to help remove impediments to the screening of coals and provide consumers with the size of coal best suited to their requirements.

Lake Shipping Gets Early Start—Distribution of coal to areas served from Great Lakes docks got off to an early start this year. The first ship left Toledo, Ohio, March 30 and the second on the following day. Both vessels were reported to have reached Saulte Ste. Marie by April 3, headed for Lake Superior ports. Distribution regulations requiring coal to be moved on the lakes in equal monthly shipments before Nov. 1, coupled with the early start of the season, are expected to assist materially in leveling off distribution to

this area and permit orderly scheduling of shipments to other regions supplied by the same mines, according to Fuels Administrator Ickes.

Local Fuels to Supplement Southeastern Coals—Because of scarcity of domestic coals mined in Districts 7 and 8 (southern West Virginia, eastern Kentucky, part of Virginia and part of Tennessee), of western coke, and briquets and packaged fuel, Administrator Ickes said it is estimated that consumers of these fuels in areas where alternative fuels are available will have to meet at least 25 percent of their annual requirements during the coal year 1944-45 in coals locally available. These limitations are embodied in SFA Regulation 21.

Utah Coals to Move in Equal Monthly Shipments—Administrator Ickes has ordered that western retail coal dealers buying bituminous and sub-bituminous coals shipped by rail from Utah mines must accept shipments of one-twelfth of their annual requirements each month throughout the 1944-45 coal year. Under terms of the new requirements, embodied in SFA Regulation 19, dealers refusing to accept regular equal monthly shipments will have their annual quotas reduced by that amount and the rejected coal will be shipped to other dealers who follow the spirit of the regulation.

SFA Regulation 20, issued March 30 and effective immediately, gives first preference to shipments of byproduct and other special-purpose coals to all destinations and second preference to lake coal commitments in other categories. The order is applicable to districts 1-11 and 13.

Anthracite Allocation Cut 10 Percent—Fuels Administrator Ickes has issued a regulation effective April 1 under which no retail dealer can receive more than 90 percent of his 1942-43 coal year tonnage of anthracite, as adjusted to reflect changes in fuel conditions in his locality. Producers and wholesalers who have tonnage left over after allocating 90 percent of the adjusted base year's tonnage to their regular customers must make such excess coal available for shipment to customers of other producers and wholesalers who cannot supply the full 90 percent.

•

Indict 8 in Ohio For Inciting Strike

An indictment charging eight persons with "urging, inducing or coercing a strike in plants or mines in possession of the United States" in violation of the Smith-Connally Labor Dispute Act has been returned by a Federal Grand Jury in Columbus, Ohio, it was announced April 13 by Attorney General Biddle. The strike, involving 800 men, occurred Dec. 18, 1943, at two Ohio mines of the Hanna Coal Co.

The defendants are officials or members of U.M.W. locals, all residents of Belmont County, Ohio.

PAPER IS PRECIOUS

Paper, like steel and rubber, is vital in making fighting material, as well as for civilian needs. The supply is getting tighter. The need for conserving it is great. Use it as sparingly as you can and make it go as far as possible. When it has served as many uses as possible, salvage it for other war service.

Federal Judge F. P. Schoonmaker, at Pittsburgh, Pa., April 20, ordered bench warrants issued for the arrest of six miners on charges of violating the Smith-Connally anti-strike law by allegedly interfering with coal production at mines under government control last November, December and January. The mines were the Indianola, Republic Steel Corp., and Somers, Pittsburgh Coal Co. Thirty miners pleaded "no defense" last autumn to charges of interfering with coal production and were given six-month suspended sentences in the nation's first such prosecution.

Five Kentucky miners were indicted April 24 by the Federal District Court grand jury at Richmond, Ky., for interference and attempted interference with two mines in Bell and Harlan counties during the Nov. 10, 1943-Jan. 25, 1944 period of government operation. The mines were: Clover Gap, P. V. & K. Coal Co., Le Junior, and Premier, Premier Jellico Coal Co., Middlesboro.

Back Portal Pay Demanded by Lewis

John L. Lewis, United Mine Workers president, demanded April 14 that Secretary Ickes, as Coal Mines Administrator, assist in compelling bituminous coal producers to pay $18,000,000 alleged to be due the mine workers as retroactive portal-to-portal pay of $40 each approved by the National War Labor Board. In a letter to Mr. Iickes making the formal demand, the U.M.W. leader charged that "certain groups of operators and WLB are in conspiracy" to defraud the miners. Payment of the back wages, he said, was guaranteed not only by the operators and WLB but by Secretary Ickes and President Roosevelt.

A new crisis seemed imminent April 19 when Mr. Ickes said that while he favored payment of the retroactive pay he was without legal authority to grant the demand. When Mr. Lewis hinted that denial of the payment might bring unrest in the coal fields Secretary Ickes cautioned leaders of both sides against "bullheadedness, unrestrained exercise of lurid vocabulary or greed and overreaching" in settling the issue.

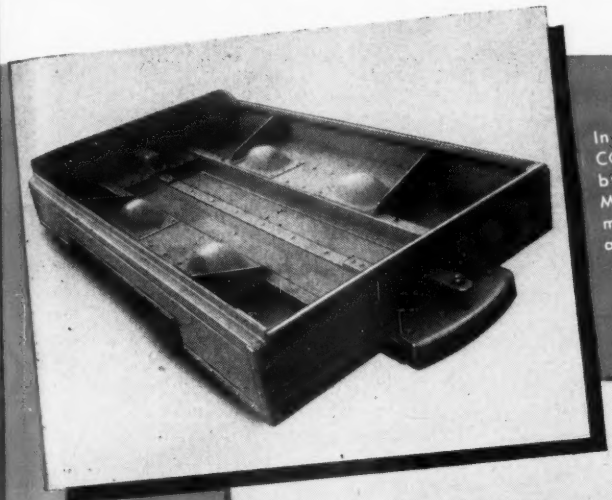
Producers representing more than 70 percent of bituminous output informed William H. Davis, chairman of WLB, April 25 that they were willing to pay miners $40 each in settlement of claims for retroactive portal-to-portal pay if this provision in a pending contract with U.M.W. is approved by the Board. Secretary Ickes also wrote to Chairman Davis supporting the offer of the operators. He said that prompt authorization was essential so that the operators might execute a supplemental agreement to pay the money.

"What is it? Why, it's me work-book full o' Defense Stamps!"

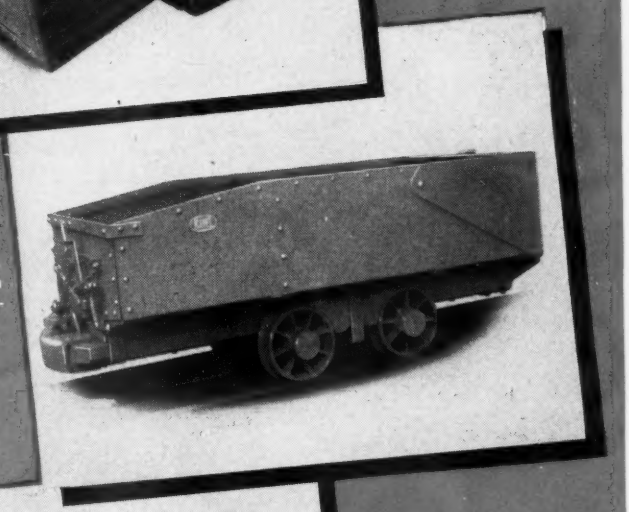
IF YOU WANT

longer life for your mine cars

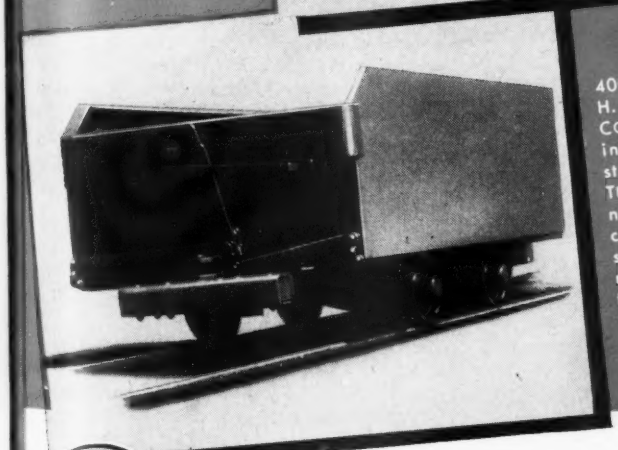
...BUILD WITH COR-TEN



In 275 cars like these, COR-TEN was specified by the Christopher Mining Co. to give maximum protection against corrosion.



COR-TEN in these 220 cars built for the Clover Splint Coal Co., insures maximum service life with minimum weight.



400 cars built for the H. C. Frick Coke Co., use COR-TEN throughout to insure long life under strenuous service. COR-TEN, used in same thickness as former plain steel construction, gives added stamina and increased resistance to destructive forces.

YOU don't have to increase the weight of your mine cars to make them stronger and longer lasting. Construction with U·S·S COR-TEN High Strength Steel makes it possible.

Used in the *same* thickness as plain steel, COR-TEN has 50% greater structural strength—will greatly increase resistance to the hard knocks and rough treatment inseparable with mine car service.

Because COR-TEN has 1/3 greater resistance to abrasion, it stands up better under the continuous wear of coal and rock handling.

COR-TEN's greater resistance to shock, impact and fatigue insures an added ruggedness that helps to absorb abuse.

COR-TEN's unusually high resistance to atmospheric corrosion—4 to 6 times that of plain steel—is an outstanding factor in making mine cars last longer, especially under wet conditions with sulfur coal.

These are established facts, demonstrated daily by more than 10,000 hard-working mine cars of all types now in service under all sorts of conditions.

If you need further information about U·S·S COR-TEN, or would like to know how COR-TEN cars are performing in service similar to your own, write us.

COR-TEN can be used to save weight, too

If you are satisfied with the life and capacity of your present equipment but want to reduce weight to the minimum, COR-TEN can be used in *reduced* thicknesses, to give you light-weight construction that, because of COR-TEN's superior physical properties, will be just as strong, and last just as long, as the heavy construction it replaces.

USS

AMERICAN STEEL & WIRE COMPANY, *Cleveland, Chicago and New York*
CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
COLUMBIA STEEL COMPANY, *San Francisco*
NATIONAL TUBE COMPANY, *Pittsburgh*
TENNESSEE COAL, IRON & RAILROAD COMPANY, *Birmingham*
United States Steel Supply Company, Chicago, *Warehouse Distributors*
United States Steel Export Company, New York

UNITED STATES STEEL

President Roosevelt's committee on portal-to-portal travel time submitted a second interim report April 11 showing weighted average of underground travel time of 55.82 minutes, based on data covering 182,863 miners producing 76.2 percent of the coal produced in underground mines having contracts with U.M.W. This compares with 55.31 minutes shown in the first report, filed Feb. 2, and is 10.82 minutes more than was assumed in the wage contract now awaiting WLB approval. Morris L. Cooke, chairman, and R. L. Ireland Jr., operator member, signed the report. Thomas Kennedy, U.M.W. member, dissented, holding that "the Committee should file no more reports until it is ready to file its final report. . . . I believe the circumstances inducing the filing of this report are calculated to prejudice in some way the case of the bituminous miners on portal-to-portal pay."

William H. Davis, chairman of WLB, said in the second week of April that the board had given no consideration to the bituminous pact.

Counsel for U.M.W. notified the Supreme Court April 18 of its intention to ask immediate review of a Federal District Court decision denying that coal miners are entitled to portal-to-portal traveling-time wages. The attorneys filed with the high court a record of the proceeding before Federal Judge A. D. Barksdale at Lynchburg, Va., who ruled against the miners Jan. 25. An appeal from this decision is pending in the Fourth Federal Circuit Court, but the mine workers' lawyers said they wanted to eliminate the time required for the Circuit Court to consider the case and preferred to have it acted upon immediately by the high tribunal.

Bipartisan House Bills For Coal Control

Eight similar national bituminous coal bills to take the place of the Guffey Coal Act of 1937, which expired last year, were introduced in the House at Washington in mid-April by a bipartisan group composed of Representatives Walter A. Lynch (D., N. Y.), B. Carroll Reece (R., Tenn.), John W. Flannagan (D., Va.), Andrew C. Schiffer (R., W. Va.), John M. Robsion (R., Ky.), Jennings Randolph (D., W. Va.), Beverly M. Vincent (D., Ky.) and Fadjo Cravens (D., Ark.). Support was announced promptly by the Coal Producers Committee, representing about 1,700 operators producing about 73 percent of the country's commercial tonnage, and by the United Mine Workers of America.

The five-man commission provided for in Sec. 2 of the bill, to be appointed by the President, is to comprise one member representing the operators, one representing the miners and three members representing the public. The term of the commissioners is to be three years, except that the public members at the outset are to be named on a 1-2-3 basis. The bill creates the Office of Consumers' Counsel and establishes 23 district boards, the districts having substantially the same geographical division as in the Bituminous Coal Act of 1937. An excise tax of 1c. per ton is provided (Sec. 3), plus a 19½ percent tax from which "code members" are exempted.

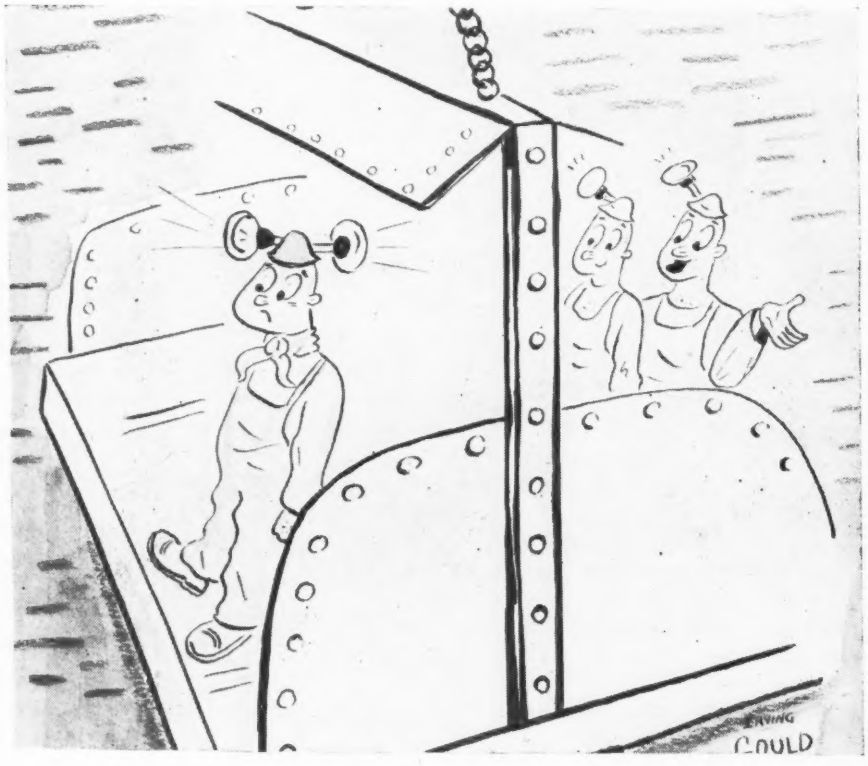
Sec. 4 of the bill, dealing with the code, parallels the provisions of the 1937 act, and, with respect to minimum prices, provides that "except as may be necessary to effectuate the provisions of Subsec. (f) of this Sec. 4, minimum prices for the coal of each of the minimum price areas . . . shall be established so that the net amount per ton which will be realized at the mine upon the sale or other disposition of the entire tonnage of coal produced in such minimum price area will approximate as nearly as may be, if all the coal is sold at minimum prices, the weighted average of the total cost per ton of producing the total ascertainable tonnage of coal of the minimum price area."

Subsec. (f) recites that "The minimum price . . . shall be just and equitable, shall not be unduly prejudicial or preferential as between and among producers within the same or different districts, shall not permit dumping, and shall have due regard to the interests of the consuming public"; and provides further, with respect to relative market values and points of delivery in each common consuming market, etc., and requires the Commission, in establishing minimum prices, to "take into account values as to uses, seasonal demand, transportation methods and charges, and the competitive relationships between coal and other forms of fuel and energy, etc." There are provisions for maximum discounts from minimum prices.

Sec. 5 of the bill makes provision for the establishment of maximum prices whenever the Commission deems it necessary in the public interest, including temporary orders pending full hearings on cost charges. Secs. 6 and 7 deal with the right of appeals and procedure. Sec. 10 provides for a uniform system of accounting and Sec. 11 for research in the use of coal and mine safety. Sec. 12 deals with the questions of marketing agencies and the circumstances under which they may be permissible, with approval of the Commission.

Sec. 13 provides for collective bargaining and is the same as Sec. 9 of the 1937 act. The act would be effective until three years after the termination of hostilities.

According to their sponsors, the measures are designed to aid in coal production for war and to give assurance of orderly and necessary coal production at fair prices when the heavy war demand ceases.



"He's wearing that other torch for his girl."

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Preparation Facilities

KELLY'S CREEK COLLIERY CO., Hugheston, W. Va.—Contract closed with Kanawha Mfg. Co. for run-of-mine loading tipple consisting of dump, bin, apron feeder, belt conveyor 150 ft. long and railroad loading chutes; capacity, 200 t.p.h.

POWELLTON COAL CO., Mallory, W. Va.—Contract closed with Kanawha Mfg. Co. for coal-handling and preparation equipment consisting of dumping and feeding equipment in headhouse, rope-and-button conveyor 450 ft. long, five-track combination steel and wood tipple including primary and dewatering shaker screens, sizing vibrator, washer for 3x¼-in. coal, sludge recovery system, four loading booms, mixing conveyor and crusher; capacity, 250 t.p.h.

Gangway!

G.I.'S COME FIRST!

. . . and that's why you haven't been able to get all the WOOD Shovels you want . . . We've been going at top speed, supplying the Armed Forces with vast quantities of regular style shovels —*plus* hundreds of thousands of the new 1943 Entrenching Shovels described below . . . This is why we have been able to supply only a bare minimum for home front use—in spite of our sympathetic realization of the needs of our trade . . . After the war, all our brands will be available in quantities as before —in quality even *finer* than before, due to improved processes developed in our *production for Victory*.

Buy

WAR BONDS
and Back the Attack!

FIGHT INFLATION
and Safeguard the Home Front!

SAVE SCRAP METAL
and Keep War Production Rolling!

A NATIONAL ORGANIZATION SPECIALIZING EXCLUSIVELY IN SHOVELS SPADES AND SCOOPS

the WOOD SHOVEL AND TOOL COMPANY
PIQUA, OHIO

Conveyor Mines and Cables Analyzed

A.C. Applications, Voltage and Transmission, Grounding Methods, Battery and Diesel Haulage, and Synthetic Rubbers for Cables Engage Beckley Meeting

SECONDARY VOLTAGE for a.c. mining, advisable limits of transmission distance, grounding methods, diesel or battery haulage and rubber substitutes for cables were the hottest subjects at afternoon and evening sessions of a joint meeting of the New River and Winding Gulf Electrical and Mechanical Institute and the West Virginia Section of the American Institute of Electrical Engineers held April 13 at Beckley, W. Va. Working the available and varying grades of rubber substitutes into insulations and jackets has been a tough pull for the wire and cable manufacturers, but they are evolving methods of mixing and manufacture that give promise that natural rubber will never again find general use in this field of manufacture.

At an afternoon technical session in the Appalachian Power Co.'s building, the following scheduled speakers presented 15-minute talks or papers: J. O. Cree, West Virginia Engineering Co., "Mine Substations of the Future"; O. G. Grow, Semet-Solvay Co., "Intelligent Use of Power in Coal Mining"; J. H. Edwards, *Coal Age*, "Electrical Trends"; R. G. Jones, Sullivan Machinery Co., "New Developments in Cutting Machines"; O. G. Stewart, Alloy, W. Va., "Trolleyless Coal Mines"; T. R. Weichel, U. S. Bureau of Mines, "Electrical Standards"; and T. J. Jackson, West Virginia Engineering Co., "A.C. Conveyor Equipment."

At a dinner, with C. C. Ballard, electrical engineer, New River Co., as toastmaster, speakers were Stanley Higgins, secretary, New River Coal Operators' Association, and D. E. Renshaw, mining section, Westinghouse Electric & Mfg. Co. Mr. Higgins stressed the urgent need for greater manpower and efficiency to combat faltering production. Mr. Renshaw discussed problems of the day, each illustrated by a story.

G. E. Ralston, chief engineer, Rome Cable Corp., also speaking at the meeting, presented a general discussion of the new synthetic insulation and jacketing materials which are now being used on wires and cables. It was he who ventured the opinion that there will be no return to natural rubber in cable work. As an outline for his discussion of characteristics of the various synthetics he used the table by E. D. Young, Okonite Co., appearing in *Electrical World*, Aug. 7, 1943.

The manufacturers are still getting neoprene, the preferred material for jackets of all mining cables. It is being discovered that the various materials can in some cases be mixed to give the resulting compound the good characteristics of each, such as dielectric, resistance to ozone, oil, abrasion and water. The factory had its troubles but has learned to vulcanize satisfactorily the thermosetting synthetics. The mines can do the same with experience and careful following of the directions of the power committee of the American Mining Congress (*Mining Congress Journal*, February, 1944, p. 105). Thermoplastic materials cannot be vulcanized.

Manufacturers are now able to make colored buna compounds and are now putting out cables thus marked. Most, however, are limiting these to six colors instead of the twelve colors formerly available. Mr. Ralston exhibited samples of many of the raw synthetic materials and the finished cable products including thermoplastic lamp cords for residence use, which he said are free from the cracking that took place in rubber cords exposed to heat and light.

In discussion following his paper, some of the mining men learned for the first time that the government directive against burning rubber insulation off of scrap cable was canceled many months ago. The original order had held up the movement of scrap copper because the companies could not afford to expend the labor necessary to cut off the rubber insulation for scraping the copper and rubber.

All-month efficiencies of rectifier substations will run 75 to 85 percent as compared to a range of 50 to 75 percent for motor-generator and converter substations, according to Mr. Cree. Although he would like to see the rectifier simplified, by electronics or otherwise, so that the control "would be just one switch with fewer gadgets to fool with," he advises those needing new substations to accept the rectifier as it is now, "for it has proved satisfactory." Four or five rectifier substations are on order for shipment to mines in southern West Virginia.

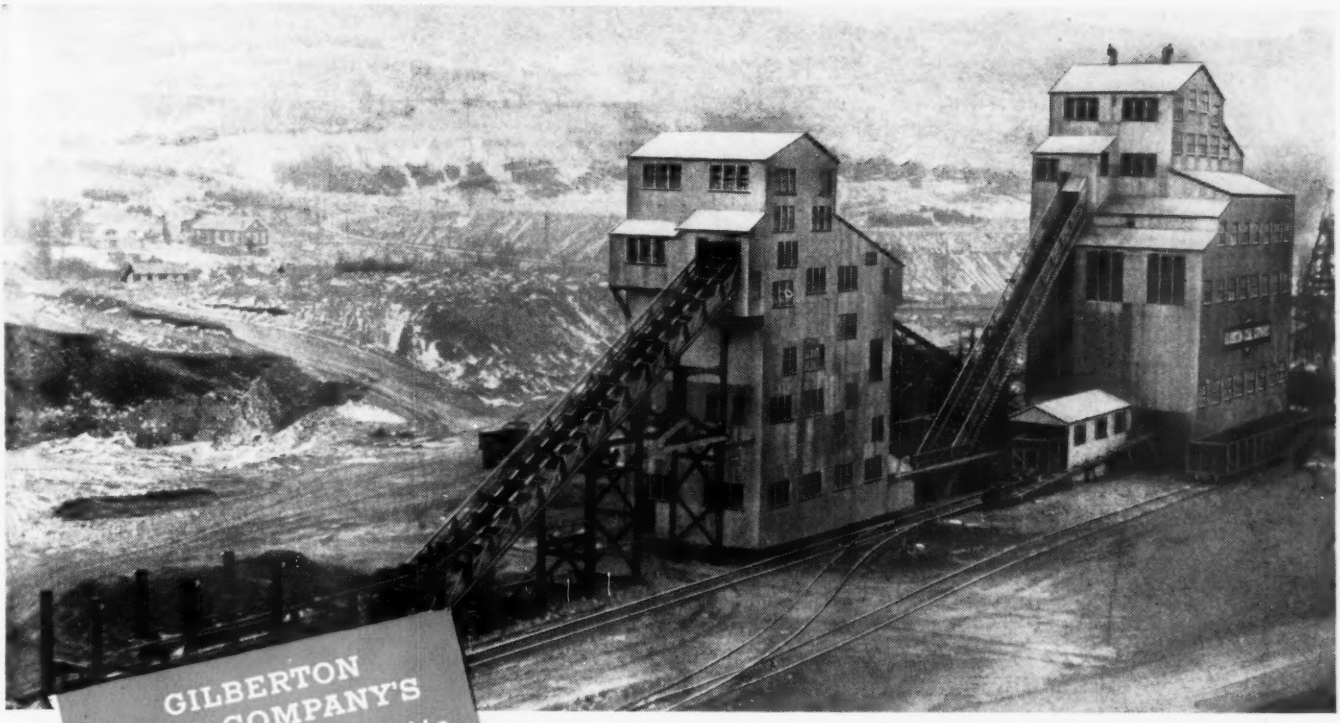
Beginning with its first application in the Joy coal saw, Mr. Jones traced the development of hydraulic controls and drives which have constituted a major improvement in cutting machinery. A universal cutter on four rubber tires and driven hydraulically instead of by gear train is now under test. Now the greatest need for improvement lies in the cutter chain so as to get away from that disproportional increase in power loss with efforts to speed up the chain.

On a.c. machines there is need for some method of control which will allow inching such as d.c. control provides. Shunt relays on machines to prevent motors going onto the line unless the voltage is up to a certain standard have not been acceptable at some mines. Mr. Jones characterized thermal relay protection as apparently not reliable. Discussing that question, Mr. Renshaw said the relays are reliable for continuous service equipment but not practically suited for the intermittent service of most mining machinery.

Mr. Jackson pointed out the many advantages of adopting a.c. for conveyor mining including the cutting. Transformers should be truck-mounted and the initial equipment not exceed 2 hp. per kilovolt-ampere of transformer capacity. That provides some margin for the usual addition of machinery but the total should not be allowed to exceed 4 hp. per kilovolt-ampere. Not disregarding safety, the secondary voltage chosen should be as high as possible. With 440 volts from Y-connected transformers and the neutral grounded, the voltage to ground is 356.

All conductors should be three-conductor and include a ground wire which should be connected to the frame of each piece of equipment served. Plugs and receptacles should all be four-pole and polarized. All disconnecting devices should

Some of the speakers, chairmen and institute officials at Beckley (left to right)—Standing: M. K. Clay, secretary-treasurer, New River and Winding Gulf Institute; O. G. Grow, Semet-Solvay Co.; G. E. Ralston, Rome Cable Corp.; T. J. Jackson, West Virginia Engineering Co.; C. C. Ballard, New River Co.; J. O. Cree, West Virginia Engineering Co.; P. M. Barlow, secretary, West Virginia Section, A.I.E.E. Seated: T. R. Weichel, U. S. Bureau of Mines; W. H. Bryant, president, New River and Winding Gulf Institute; D. E. Renshaw, Westinghouse; O. G. Stewart, Alloy, W. Va.; A. M. Rosenblatt, chairman, West Virginia Section, A.I.E.E.; L. W. Roush, chairman program committee, A.I.E.E.



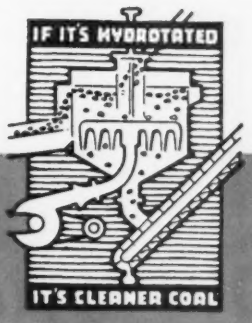
GILBERTON
COAL COMPANY'S
Modern Anthracite
Preparation Plant
GILBERTON, PENNA.

Main Breaker Built in 1941
Capacity 3000 Tons Feed, 7 Hrs.
Pre-Cleaner Plant Built 1943
Combined Capacity, Breaker and Pre-Cleaner Plant, 4500 Tons Feed, 7 Hours.

WILMOT Builds Better Breakers

The tremendous advantages of speed, efficiency and economy in coal preparation as provided by Wilmot Hydrotators and auxiliary preparation equipment offers a product and profit yield that merits your most serious consideration in post-war construction plans. Anthracite breakers built by and/or equipped by Wilmot are demonstrating, during peak production war times, an outstanding degree of efficiency in handling larger tonnages and maintaining uniformly high quality. A Wilmot Hydrotator installation NOW will solve your problems for the present . . . *but*, for the future, remember, *Wilmot Builds Better Breakers!*

Wilmot Hydrotators have been proved by every known test to be the most highly efficient hydraulic coal cleaning unit.



WILMOT ENGINEERING COMPANY

General Offices: HAZLETON, PA. • *Foundry & Shops,* WHITE HAVEN, PA.

Builders of Better Breakers • Manufacturers of Superior Coal Cleaning Equipment

HYDROTATORS • CLASSIFIERS • HYDRO-SEPARATORS • SIMPLEX JIGS

Portable Cleaners • Crushing Rolls • Bucket Elevators • Sizing Shakers • Conveyors • Keystone Alvetless Chain, Etc.

CHECK AND DOUBLE CHECK

Check the course of Cummins Dependable Diesels since the beginning—26 years ago. You'll find that the trend has been always toward higher horsepower output per pound of engine weight through HIGHER ENGINE SPEEDS. Then double check the record of Cummins Diesel Power in every heavy-duty service—automotive, industrial and marine. You'll find that the result has been consistently the same . . . increased payloads . . . improved performance . . . higher profits.

CUMMINS ENGINE COMPANY, INC., Columbus, Ind.

CUMMINS *Dependable* DIESELS

SINCE 1918...PIONEER OF PROFITABLE POWER THROUGH HIGH SPEED DIESELS

HEAVY-DUTY MODELS FOR STRIPPING, HAULING, AND GENERATING SERVICE

be three-pole and gang-operated, and that goes for fuses. If the lower voltage, 220, is used, transmission distance should be limited to 500 ft. The ground wire of the 2,300-volt or 4,000-volt primary feed cable should have a permanent outside ground testing not over 10 ohms.

In the field of electrification, maintenance and operation, J. H. Edwards listed as presently accepted and rapidly expanding the following: rectifier substations, tire welding, mechanical track cleaners and special cars, trucks and tools for maintenance and service of supplies. He predicted a greater use of storage batteries, more underground telephone systems with lines or cables buried in the mine floor and in gassy mines the elimination of doors or their safety supervision by automatic electrical equipment.

In the realm of operation there will be a lot more use of water on cutter bars plus sprinkling at points of transfer, more construction of high-pressure seals in gassy mines to cut off abandoned workings completely. There will be an increase in horizontal drilling through coal seams to provide drainage short cuts, save pipe and for more adequate protection in approaching abandoned workings.

Other discussions at the afternoon meeting brought out the following points: An a.c. conveyor mine recently installed uses 350,000-cir.mil wires and transmits the 220-volt power serving three cutters and several conveyors a maximum of 1,800 ft. Floor cables are all three-conductor and a separate single-conductor ground wire is carried to all. All disconnecting devices are such that no mistakes in polarity can be made. Diesel locomotives are favorably considered for main underground haulage to eliminate the complication of a separate d.c. system and the danger of open trolley wires.

At mines in general, cutting, hauling and preparation account for only 25 to 30 percent of the power consumption yet those get most of the attention. Other items constituting 70 to 75 percent, some of which operate 24 hours per day, unfortunately get the least attention because they are not direct production items. Many fans are operating at efficiencies between 30 and 50 percent while fans giving 80 percent efficiency are available. New substations but using ancient machines may be wasting power at the rate of $1,200 per year compared with latest designs available. Discharge pipes too small for mine pumps are a scourge. A change from 2,300 volts to 4,000 volts reduces primary losses to one third.

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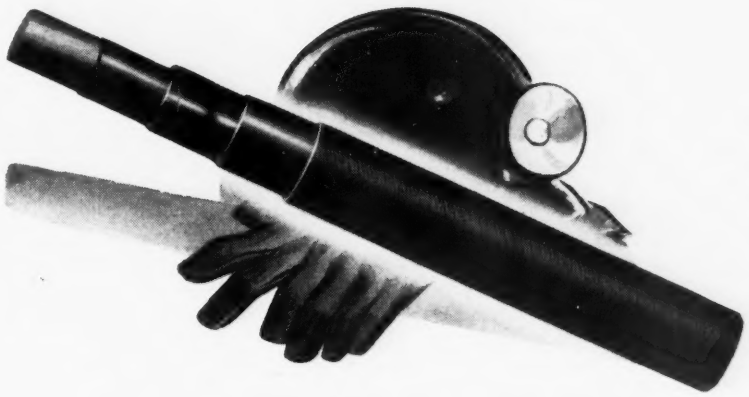
Labor Board Approves Anthracite Pact

Clearing the way for return of the Pennsylvania anthracite mines to private operation, tentatively scheduled for about the middle of May, the War Labor Board approved April 7 a wage contract for hard-coal mines to take the place of the one which expired April 30, 1943. The pact is the same as the Ickes-Lewis agreement, under which the government operated the

The CABLE that Mines More Coal



DELTABESTON

Every time the maintenance crew hauls away a mine locomotive to repair a cable, coal production suffers. That's why mine electricians and superintendents choose Deltabeston. They know that Deltabeston Apparatus and Motor Lead Cable operates with the utmost dependability in the difficult conditions encountered in the coat pits. Deltabeston is highly resistant to heat, flame, moisture, oil, grease and most corrosive vapors. It's the cable that mines more coal.

Here's five reasons why Deltabeston Apparatus and Motor Lead Cable is used so extensively on mine locomotives, cutters, loaders and other mining apparatus.

1. Very soft, small copper strands — for greater flexibility and to withstand vibration.

2. Impregnated felted asbestos — for protection against overload heat.

3. Varnished cambric — for moisture resistance and high dielectric strength.

4. Felted asbestos — for extra protection against high ambient temperatures.

5. Asbestos braid — for high resistance to heat, moisture, oil and grease.

For additional information write to Section Y541-10, Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn. Deltabeston Asbestos-insulated Wires and Cables are distributed nationally by Graybar Electric Co., G-E Supply Corp. and other G-E Merchandise Distributors.

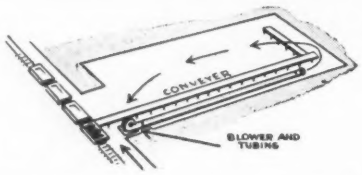
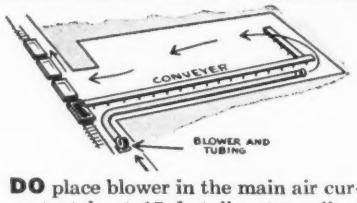
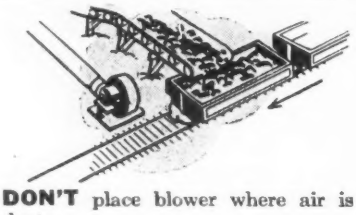
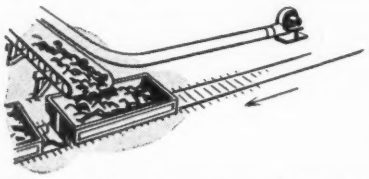
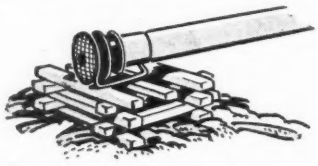
BUY WAR BONDS

Hear the General Electric radio programs: "The G-E All-girl Orchestra" Sunday 10 p.m. EWT, NBC. "The World Today" news every weekday 6:45 p.m. EWT, CBS

GENERAL ELECTRIC

AVOID THESE COMMON MISTAKES IN USING BLOWERS AND TUBING

There's a right way to get greatest efficiency and safety with "Ventube"

WRONG	RIGHT
 **DON'T** place blower in room neck with no other outlet for air.	 **DO** place blower in the main air current at least 15 feet "upstream" of the outgoing air. This avoids re-circulation.
 **DON'T** place blower where air is dusty.	 **DO** keep blower away from the dusty discharge point of conveyers.
DON'T let blower become buried in rubbish.	 **DO** keep blower intake clear . . . allow adequate air supply *always*. Mount on crib, if necessary.

Properly used, blowers and tubing are important assets in many mines today. They carry adequate quantities of clean air up to the dead ends of entries and rooms where the main current would never go unaided, bringing much-needed oxygen to hard-working men. After a blast, they clear the face, reducing waiting time and adding many productive minutes to every shift.

But improperly used, blowers and tubing—like most other mine equipment—may be inefficient and unsafe. Practical experience shows these *wrong* and *right* ways to use blowers and Du Pont "Ventube."

Du Pont "Ventube" is flexible tubing, sturdy fabric impregnated and coated with a special abrasion-resistant compound. It resists heat, moisture, mildew, dry-rot, acid and alkaline waters. It is easily carried and stored. If damaged by careless handling, it is as easily patched as an inner tube.

Properly suspended, free of sharp bends, and attached to a fan with adequate capacity and with permissible motor, "Ventube" flushes the face with fresh air . . . helps remove dust and bad air from any space a man can enter . . . speeds the production cycle . . . promotes health and steady efficiency of workers . . . is a vital part of the nation's war production effort. Use "Ventube" . . . and when you do, use it *right*. E. I. du Pont de Nemours & Co. (Inc.), "Fabrikoid" Division, Fairfield, Connecticut.

NOTE: *War Production Board regulations permit us to supply "Ventube" for all mining purposes. To expedite delivery, it is urged that you furnish us with complete priority information on your orders.*

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VENTUBE*
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**"VENTUBE" is Du Pont's registered trade mark for its flexible, rubberized ventilating duct.*

DU PONT REG. U.S. PAT. OFF. BETTER THINGS FOR BETTER LIVING...THROUGH CHEMISTRY

mines after seizing them for the second time in November, 1943.

The new contract provides a wage increase of 70c. a day over the old contract rates, 32.2c. to meet living-cost increases under the Little Steel formula and 37.8c. for lengthening the work day through shortening of the lunch period by 15 minutes. The board explained that part of the 37.8c. increase above the Little Steel formula was to compensate for $25 in 1943 vacation pay still due each employee. The board also said it gave its approval of the contract on the understanding that the anthracite mines would continue on an actual work day of 7¼ hours, exclusive of the lunch period, and that no further claim would be made by the miners for 1943 vacation pay. The new pact calls for $50 in vacation pay.

Following approval by WLB of the Ickes-Lewis agreement an increase in anthracite prices of from 35 to 70c. a ton was authorized by Stabilization Director Fred M. Vinson to compensate the operators for the increased costs which resulted. In its order of April 7 WLB said that if further price relief was required Mr. Vinson's approval would be necessary for the new wage rates to become effective.

Representatives of hard-coal producers were reported April 11 as seeking supplementary price adjustments to cover increased labor costs under the new wage contract. They conferred with officials of the Office of the Price Administration and the United Mine Workers. It was reported that the operators proposed informally to OPA officials that a temporary price increase of 61.8c. granted last Nov. 23 be extended beyond its scheduled expiration, June 1.

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Another Coal Inquiry For Canada

A royal commission to study all aspects of the production and distribution of coal in Canada is to be named by the Canadian Government, C. D. Howe, Minister of Munitions and Supply, told the Canadian House of Commons prior to the recessing of parliament late in March. The commission is to report with recommendations for such modifications of the pre-war coal policy as may be necessary. Mr. Howe announced a revised policy on coal subsidies affecting western fields.

When there was an acute shortage of coal, subsidies were paid certain high-cost producers to stimulate production. These covered all losses, plus an item of profit. Domestic coal, said Mr. Howe, now is in surplus supply, but the government has to consider a more suitable method of assisting mines that might collapse if government assistance were withdrawn. Beginning April 1 coal producers who had been operating at a loss were to be paid subsidies ranging from 65c. a ton for mines in Edmonton to 15c. on shaft mines in Saskatchewan, the subsidies representing the average increased cost due to wage boosts and the cost of living bonus..

About 500 miners in the Edmonton (Alta.) district were idle April 1 as eleven union mines were closed by operators in

G. I. finds a friend

G. I. (as the Yank soldier prefers to call himself) has to handle a lot of wire rope these days. On landing barges . . . on cranes, hoists, and power shovels . . . and especially on trucks and tanks, most of which carry an emergency winch cable as standard equipment. For such uses, Bethlehem has supplied millions of feet of wire rope—much of it in our top-quality Form-Set (preformed) construction.

When a truck is mired, or when there's a heavy hauling job to be done, the G. I. winch cable is a friend in need. And when it's supple, easy-handling Form-Set it's doubly a friend. That means a lot to G. I., who as likely as not was a traveling salesman or grocery clerk in civilian life, and had no experience in handling wire rope.

Because its strands and wires are preformed in their corkscrew shape, Form-Set is free from locked-up constructional tensions. It's easy to splice and spool, requires no seizing, and sprouts no spiny wire bristles to slash the hands of men who work with it. All of which explains why Government agencies have bought it in such vast quantities for military operations.

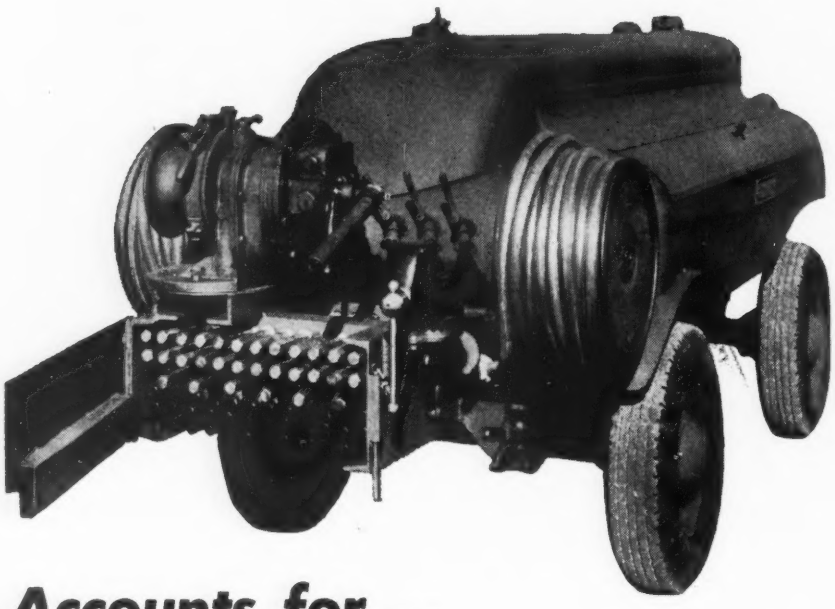
You get the utmost in service and long life from Form-Set when it's in the Purple Strand grade. Purple Strand wire rope is made of strong, tough Improved Plow Steel, the highest-quality steel that's used in wire-rope construction.

In Form-Set Purple Strand you get the ideal combination of preformed ease of handling with the unmatched strength and ruggedness of Improved Plow Steel. Plan to order it for your next wire rope job, or for replacements. But make your plans, please, as far in advance as possible, so that you will be sure to have Form-Set Purple Strand Wire Rope when you need it.

Form-Set
Purple Strand
Wire Rope

★ ★ BETHLEHEM STEEL ★ ★

AIR WHERE YOU WANT IT



Accounts for...

EVER-WIDENING USE OF SCHRAMM IN MINES

Mine operators in distant or inaccessible locations have reason to appreciate Schramm air compressors—and install them in ever-increasing numbers.

Schramm delivers air where you want it... is a hard-hitting compressor, built to blaze trails if need be to get right next to the job and furnish as much compressed air as you want.

Outstanding Schramm features responsible for this 24-hour-a-day performance are: 100% water cooling... mechanical, cam-operated intake valve... large discharge valves in head... forced feed lubrication to every moving part, through oil lines drilled in metal... main bearings for each cylinder... safe, fast, easy starting merely by pushing a button! Too, there's weight reduction up to 40% without sacrificing an ounce of ruggedness. This means a compact, lightweight Schramm offering you more advantages. Write today for details in Catalog 42-PA.

SCHRAMM INC. THE COMPRESSOR PEOPLE WEST CHESTER PENNSYLVANIA

protest over the 65c. a ton subsidy granted by the Dominion Government. One operator said skeleton crews would be maintained for several days and if no increase was granted in subsidies they would be withdrawn and the mines closed for good. Operators ask for a 79c. subsidy.

After studying the report of the Ontario Fuel Commission on the government lignite project in northern Ontario the Ontario Legislature's lignite committee recommended to the chamber April 3 that work at the property be continued while the committee continues its investigations after the House session ends and a visit is made to the property. In an interim report the committee suggested that the lignite property might be taken into consideration by the new department of planning and development. It also sought authorization from the Legislature to review any further reports of the provincial Fuel Commission on supply of peat, coal and other fuels and to make recommendations on such reports. The committee recommended that it hold a public meeting in northern Ontario during its visit to the $855,000 government

COAL ACTIVITY

Bituminous Coal Stocks

	Thousands Net Tons Mar. 1 1944	—P.c. Change— From Feb. 1 1944	From Mar. 1 1943
Electric power utilities	13,915	+0.3	−26.9
Byproduct coke ovens	6,399	+3.8	−34.6
Steel and rolling mills	765	+1.6	−28.4
Railroads (Class I)	9,586	−2.8	−15.6
Other industrials*	16,522	−9.3	−41.2
Total	47,187	−6.0	−29.1

Bituminous Coal Consumption

	Thousands Net Tons Feb. 1944	—P.c. Change— From Jan. 1944	From Feb. 1943
Electric power utilities	6,694	−7.7	+24.7
Byproduct coke ovens	7,583	−5.5	+8.8
Steel and rolling mills	993	−2.6	−2.7
Railroads (Class I)	11,481	−4.8	+8.6
Other industrials*	13,599	−4.7	−4.7
Total	40,350	−5.3	+3.3

* Includes beehive coke ovens, manufactured-gas plants and cement mills.

Bituminous Production

March, 1944, net tons	54,330,000
P.c. change from March, 1943	−3.3
January-March, 1944, net tons	160,870,000
P.c. change from Jan.-March, 1943	+5.4

Anthracite Production

March, 1944, net tons	5,373,000
P.c. change from March, 1943	−7.1
January-March, 1944, net tons	16,480,000
P.c. change from Jan.-March, 1943	+6.7

Sales, Domestic Stokers vs. Oil Burners

	Stokers	Burners
February, 1944	1,398	3,195
P.c. change from Jan., 1944	−2.7	+66.4
P.c. change from Feb., 1943	−34.3	+103.3
January-February, 1944	2,835	5,117
P.c. change from Jan-Feb., 1943	−27.2	+40.6

Index of Business Activity*

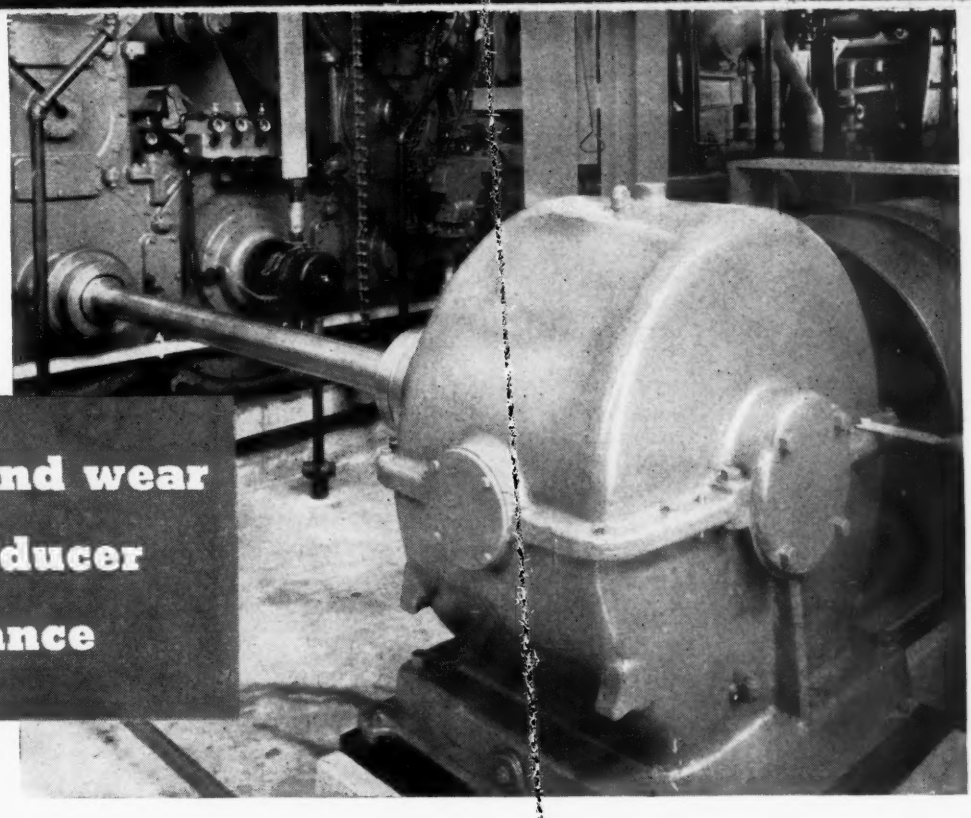
Week ended April 15	239.5
Month earlier	239.5
Year earlier	283.2

* *Business Week*, April 22.

Electric Power Output†

Week ended April 15, kw.-hr.	4,307,498,000
P.c. change from month earlier	−2.7
P.c. change from year earlier	+10.0

† Edison Electric Institute.



Avoid work and wear in speed reducer maintenance

Barring mechanical faults in equipment, the right oil will help avoid numerous difficulties which haunt overworked speed reducers or bath-oiled gears—particularly deposit, emulsion, foaming and starting troubles. If you find it necessary to clean gear cases or change oil in them frequently, or if you find too much gear wear, it should pay you to review your oil requirements.

Look into the qualities of Stanoil. Many operators have found it ideal for these services. Why it has proved so effective is discussed in the "trouble" and "cure" columns at the right.

Let a Standard Lubrication Engineer help you test the right grade of Stanoil. Call the nearest Standard Oil Company (Indiana) office, or write 910 S. Michigan Ave., Chicago 5, Ill., for the Engineer nearest you. In Nebraska, write Standard Oil Company of Nebraska at Omaha 2.

Oil is Ammunition . . . Use it Wisely

STANOIL

Causes of oil trouble in speed reducers

Deposits. Under heat and agitation in the presence of oxygen, some oils oxidize—that is, certain unstable hydrocarbons undergo a chemical change. Some form asphaltenes which settle out of the oil. Others form acidic substances which attack certain metals, and form metallic soaps. Both cause deposits which may clog oil passages and lead to excessive wear on bearings and gears.

Emulsions and foaming. Acidity also reduces the demulsibility of oil. Any moisture that enters gear cases through leakage or condensation, will mix with the oil and form an emulsion—particularly if dirt or foreign matter is present. This reduces the oil's lubricating quality, causes foaming and may also cause clogging of oil lines.

Hard starting. This trouble occurs most frequently where speed reducers must operate under widely varying temperatures. These units may be warm enough when running to require a fairly heavy oil. But the same oil, at cold starting temperatures, is usually stiff—it boosts power demands. Units may refuse to start at all until heated. When lighter oils are used, starting is easy, but as the temperature rises, most light oils thin out excessively, and cannot give proper protection under load.

How Stanoil helps avoid them

High stability. The problem in producing an oil that reduces deposits is to remove the unstable hydrocarbons—those that unite readily with oxygen. This has been accomplished in Stanoil by a unique refining process. Stanoil has high stability against oxidation. Frequent oil changes made necessary because of high oil acidity, or gear case cleaning to remove deposits, are materially reduced with Stanoil.

Good demulsibility. The high oxidation stability of Stanoil gives it great resistance to acidity formation—one reason why Stanoil does not emulsify readily with water even in the presence of dirt. Also, Stanoil separates easily from water and may be used for long periods without emulsion or foaming trouble.

High viscosity index and low pour test. The combination of these qualities is needed to eliminate starting troubles. High V. I. prevents excessive thickening at low temperatures, and excessive thinning out at high temperatures. Low pour point prevents oil flow stoppage caused by paraffin wax formation. All grades of Stanoil have this combination of qualities in very high degree. That is why the same grade of Stanoil helps cold speed reducers to start more easily, yet gives perfect lubrication under high operating temperatures.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

LUBRICATION ENGINEERING • • LUBRICATION ENGINEERING • • LUBRICATION ENGINEERING • • LUBRICATIO

THANKS TO YOU MINE OPERATORS AND SUPERINTENDENTS

FOR HELPING US KEEP

GENUINE FLEXIPIPE

ABREAST OF YOUR NEEDS

SINCE 1915, when Bemis Bro. Bag Co. pioneered Flexipipe, *the first flexible ventilating tubing,* we have had the close cooperation of mine operators and superintendents. This has enabled us to take advantage of technical and chemical advancements which have kept Flexipipe fully abreast of the varying mine requirements.

That cooperation has been most helpful to Bemis and it's gratifying that the benefits have, in turn, gone back to your industry that is serving our country so importantly and so well. We'll continue trying to make an even better product for your use and, with your continued cooperation, we're confident of progress.

Genuine Flexipipe which keeps fresh air at the working faces, is made of tough, specially woven fabrics to withstand rough mining usage. It's specially treated to resist damage from gas, fungus growth, heat, acid and alkaline waters. It's compact, lightweight, flexible, easy to handle, economical. Available in three grades.

Mail the coupon today for descriptive literature.

Specify GENUINE FLEXIPIPE

THE ORIGINAL FLEXIBLE VENTILATING TUBING

BEMIS BRO. BAG CO., 412 Poplar Street, St. Louis 2, Missouri

Please send literature on *Genuine Flexipipe*

Name _____

Company _____

Street _____

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COMING MEETINGS

- **Mine Inspectors' Institute of America: annual meeting, June 5 and 6, Daniel Boone Hotel, Charleston, W. Va.**
- **Smoke Prevention Association: annual meeting, June 6-9, Hotel Statler, Detroit, Mich.**
- **American Retail Coal Association: annual meeting, June 7, Morrison Hotel, Chicago.**
- **Rocky Mountain Coal Mining Institute: annual meeting, June 8-10, Cosmopolitan Hotel, Denver, Colo.**
- **Illinois Mining Institute: annual summer meeting and boat trip, scheduled for June 9-11, aboard Str. "Golden Eagle" from St. Louis. Cancelled May 4.**
- **American Society of Mechanical Engineers: semi-annual meeting to discuss problems of industry, production, transportation and management —June 19-22, William Penn Hotel, Pittsburgh, Pa.**
- **American Society for Testing Materials: annual meeting, June 26-30, Waldorf-Astoria Hotel, New York City**

project 126 miles from Cochrane, still in the exploratory stages.

Zoning of Canadian coal purchasing areas to provide assured markets for Dominion-mined coal against competition from imports was advocated by L. D. Currie, Mines Minister of Nova Scotia, in a conference with Humphrey Mitchell, Canada's Minister of Labor. Mr. Currie recommended a "policy of zoning Quebec and a part of Ontario, leaving a free and uninterrupted area for Nova Scotia coal. Other zones would be set aside for imported coal in places that could not under any conditions be supplied by Nova Scotia and a western zone could be delimited for Alberta coal. This might mean an alteration in the present coal subvention and fiscal policy and would necessitate an agreement with the United States Government," he said.

The minister said he made the proposal as a practical suggestion for a permanent solution to the problem of placing the Nova Scotia coal industry on a secure basis.

The government prohibited the inciting of strikes April 18 for the duration under a special emergency powers regulation effective immediately which virtually outlaws all but union-organized walkouts. Under the new regulation, any inciting to strike outside a regular union meeting is subject to penalties ranging up to five years imprisonment and $2,000 fine.

The Alberta Coal Committee presented to members of the Federal Cabinet in Ottawa April 17 a brief urging immediate subventions to insure and maintain movement of domestic and bituminous coal from Alberta and southeastern British Columbia to railway retailers and other users of coal east of Winnipeg.

EXAMPLE OF *Service*:

A chain of 150 motion picture houses was having consistent trouble with its power equipment. Many experts tried to correct it and failed... then one of our Cities Service Lubrication Engineers tackled the problem. With the exclusive Cities Service *Industrial Heat Prover* he analyzed combustion... made necessary adjustments. In the two years since, these plants have shown greater efficiency, lower operating costs.

More and more, it's service that counts...

and *Cities Service* means good service!

CITIES SERVICE OILS — ONCE-ALWAYS

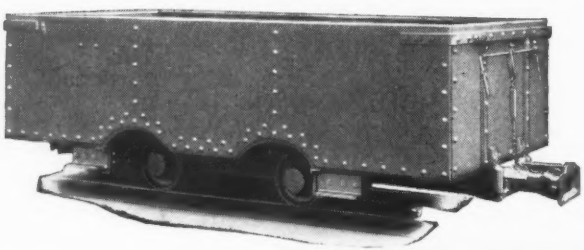
CITIES SERVICE OIL COMPANY

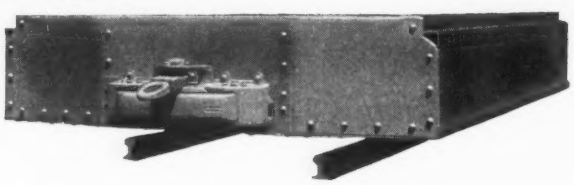
ARKANSAS FUEL OIL COMPANY

Dependable MINE CARS

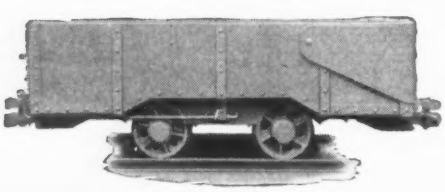
Steelcar

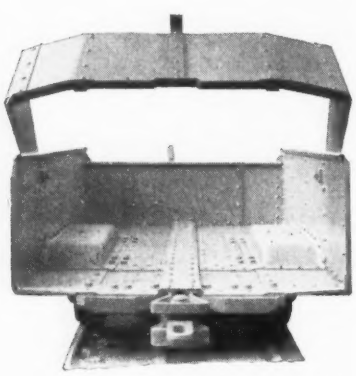
TO MEET YOUR SPECIFIC OPERATIONS

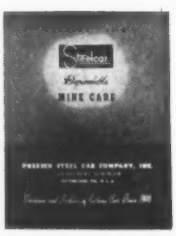




Modern steel cars that provide increased capacity with the best ratio of live load to dead weight. Designed and built to meet your specific clearances and requirements.







Full data and descriptive brochure gladly sent on request.

"Designers and Builders of Railway Cars Since 1898"

PRESSED STEEL CAR COMPANY, INC.
INDUSTRIAL DIVISION
PITTSBURGH, PA.

Coupled with recommendations for immediate action to avert an impending crisis was a suggestion that the government consider a national coal policy to keep Canadian mine and railway employees "steadily employed with a view to maintaining their purchasing power . . . with resulting benefit to the nation."

A contract signed April 22 between U.M.W. and Dominion Coal Co., replacing one that expired Jan. 31, 1943, provides a wage increase of $1 a day and vacations with pay for about 9,000 workers in Cape Breton and Cumberland counties. Its provisions are in line with a recent decision of the National War Labor Board. The union signed a similar contract with Old Sydney Collieries, Ltd., operating on the north side of Sydney Harbor. Agreement has been reached with Acadia Coal Co., the other of the big three Nova Scotia coal companies, and signing of the contract is expected in a few days. The contracts run to Jan. 31, 1945.

•

C. & H. Acquires Peabody Holdings

Coal land and mineral rights of the Peabody Coal Co. in Vermilion County, Illinois, belonging to the Peabody Coal Co. have been acquired by the Chicago & Harrisburg Coal Co., according to a quit claim filed March 29. The price was in the neighborhood of $90,000 it was indicated by the revenue stamp on the deed.

•

Bankston Develops New Slope Mine

Bankston Creek Colliery Co. has begun development of a ne wslope mine in the No. 5 vein six miles west of Harrisburg, Ill. The new operation will be known as Bankston Creek Colliery No. 7, according to Paul Halbersleben, superintendent of the company, and will be put in operation within six months if wartime demand for coal warrants such production expansion.

•

Bituminous Institute Elects 15 Directors

Fifteen new directors were elected at the first meeting of members and contributors to the Bituminous Coal Institute, held April 11 at the Hotel Biltmore, New York City, with 32 members present. The new directors are: O. L. Alexander, H. T. DeBardeleben, J. D. Francis, Calvin Holmes, R. L. Ireland Jr., R. E. Jamison, Ralph Knode, Hooper Love, Fred S. McConnell, J. B. Morrow, Daniel A. Newhall, M. L. Patton, George W. Reed, Grant Stauffer and J. P. Williams Jr. The policy committee includes Messrs. Williams (chairman), Ireland, Jamison, Stauffer, Reed and Francis.

A report of the institute's activities since its inception ten months ago was presented both orally and with exhibits by Harry M. Vawter, director. Seven displays of enlargements of the "ads" sur-

"THIS *is synthetic rubber*"

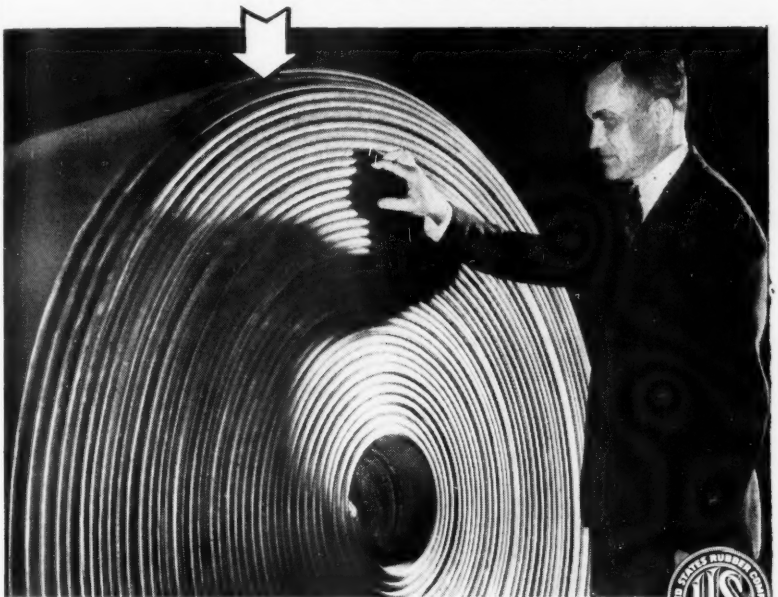
One is a raw material... the other a finished synthetic rubber conveyor belt, made by United States Rubber Company for tough wartime service. Between the two lies a wealth of applied scientific knowledge, technical skill and compounding experience.

For years we have been making conveyor belts with synthetic rubber for special installations. This was in keeping with our policy to design and build each conveyor belt to meet the specific conditions involved.

Now that synthetic rubber is a "must" for *all* conveyor belts this policy continues.

For the mining industry, U. S. Synthetic Rubber Conveyor Belts—underground, slope, or tipple—are engineered to meet all normal physical and chemical forces encountered on their individual jobs... also to have the essential characteristics of *flexibility, for proper troughing, and perfect alignment.*

"AND *so is this*"



SERVING THROUGH SCIENCE

THEY'RE FLEXIBLE—THEY TROUGH—THEY'RE ALIGNED... Hundreds of thousands of feet of U. S. Rubber Conveyor Belting are helping today to rush coal from face to preparation plant. At left is a typical 30-in. underground mother belt. At right is a 54-in. U.S. Matchless Slope Belt.

Listen to the Philharmonic-Symphony program over the CBS network Sunday afternoon, 3:00 to 4:30 E.W.T. Carl Van Doren and a guest star present an interlude of historical significance.

UNITED STATES RUBBER COMPANY

1230 SIXTH AVENUE, ROCKEFELLER CENTER, NEW YORK 20, N. Y. • *In Canada:* DOMINION RUBBER CO., LTD.

POUNDING THOSE RAIL JOINTS!

What this fellow is doing gives some idea of what is actually happening when cars and locomotives pound twenty-four hours a day over the rail joints of your main haulage track.

But this same jointed track, when converted by Thermit welding into long stretches of continuous rail, results in a saving of approximately 45% in track maintenance. Battered, chipped rail ends are eliminated; cars run smoother, so there's less spillage; and wear and tear on rolling stock is minimized.

Another important advantage resulting from Thermit welded rail joints is lower power consumption. Power losses at the joints are abolished, since the weld has the same conductivity as the rail itself.

You'll find that Thermit welding solves many of your repair problems, too. Axles, crankshafts, and many other heavy equipment parts can be restored to operation with a minimum of time and cost.

Write today for your copy of "Continuous Rail for Main Haulage Track."

METAL & THERMIT CORPORATION
120 BROADWAY, NEW YORK 5
ALBANY • CHICAGO • PITTSBURGH • SO. SAN FRANCISCO • TORONTO
Specialists in welding for nearly forty years. Manufacturers of Murex Electrodes for arc welding and of Thermit for rail welding.

rounded by covers of the periodicals in which they appeared—representing 350,000,000 readers—was a highlight of the report. In addition, a 20-ft. gallery of photographs recently taken of various aspects of the industry was shown.

Three companies producing a total of over 5,000,000 tons annually joined the institute, and it was announced that membership had increased from 53 to 74 since its foundation last summer.

•

Consolidation Buys Union Operations

Consolidation Coal Co. has arranged to acquire the operating properties of the Union Collieries Co. in Allegheny and Westmoreland counties, Pennsylvania, with payment to be made with 185,000 shares of Consolidation common stock. A special meeting of Consolidation stockholders was called to approve issuance of stock to complete the transaction.

•

Boulder Valley Opening New Mine

A new mine is being opened by the Boulder Valley Coal Co. a half mile east and a half mile south of Dacona, Weld Co., Colo., served by the Union Pacific R.R. The main shaft will be 10x16 ft. and the air shaft 8x10 ft. and 231 ft. deep to the top of the coal. Drillhole records show 6 to 8 ft. of coal. A steel tipple has been purchased from the Norwood-White Coal Co., Des Moines, Iowa, and a main hoist from the Norton Coal Co., Nortonville, Ky. The new operation is expected to be producing by October next and output is expected to reach 1,000 tons per shift.

•

Anthracite Safety Men Hold Annual Banquet

Celebrating the completion of the first full year of its existence, the Anthracite Safety Engineers' Association held its first annual banquet April 20 in Hazleton, Pa., with 125 persons present. The organization has 56 members representing 21 companies. During the year it has held specific sessions to discuss stray currents, blasting practices, delay detonators, explosives, safety manpower, safety equipment, care of wire rope, mechanical mining and other subjects. Osborne Morgan, safety engineer, Lehigh Valley Coal Co., Wilkes-Barre, is president.

Guest speaker at the annual banquet was P. L. G. Hasskarl, safety engineer, Pennsylvania Power & Light Co., who discussed accidents in the electrical industry. The human element, he said, is the principal cause of casualties. The questions for safety men to ask are: (1) How well trained are workers? (2) How skilled are they? (3) What is their temperament or attitude? (4) How well supervised are they? (5) How well is a correct performance of their duties enforced?

Tim Malloy *says...*

Glad we changed to WHEAT — a thirty minute checkup, instead of 2 hours of labor, gives me time to properly take care of my other duties.

WHEAT *the approved cap lamp*

THESE FEATURES MAKE *WHEAT* THE OUTSTANDING ELECTRIC CAP LAMP

- Two bulbs (one for emergencies)—miner is never in the dark.
- Headpiece weighs less than 6 ounces, Lamp Cord 6 ounces, Battery 62 ounces—Total weight of Lamp complete, 74 ounces.
- Headpiece molded of strong bakelite, sealed, moisture-proof and dust-proof.
- Rubber battery case—non-conductor of electricity—a valuable safety feature.
- Battery solution (free) limited to one ounce total both cells.
- Lead-acid type battery maintains high voltage throughout shift (80+ percent efficiency)—year after year.
- Battery charged through headpiece and cord of cap lamp—a daily test of all connections.
- Designed for self-service charging system for lowest lamp-house operating cost.
- To charge, headpiece is simply slipped on to key in charging rack, and turned to make contact. Nothing to take apart—unit-sealed construction.

Write today—

WHEAT LAMP SALES, INC.

1501 Kanawha Valley Bldg., Charleston, W. Va.

SPECIALISTS IN MINE LIGHTING FOR 30 YEARS

KOEHLER MFG. CO.

Marlboro, Mass.

KOEHLER SAFETY LAMP

RUGGED · DEPENDABLE SENSITIVE

Cutting Slurry Handling Costs in Coal Washing

The operations of a midwestern coal company involve handling 600 to 1,000 gallons per minute of coal washery slurry which has a high pyrites and sulphur content. An analysis shows 100% minus 3 mesh, 85% minus 6 mesh and a specific gravity of approximately 1.5. About 45 tons of solids per hour are handled. The conditions involve a 36′ lift and discharging through 700′ of 6″ wood stave pipe.

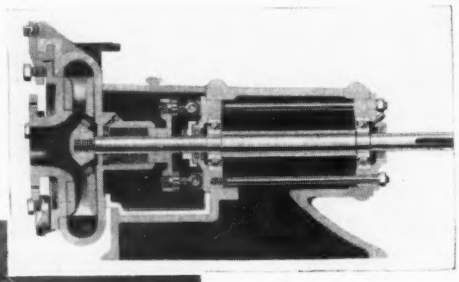
In August, 1942 the company wrote us:

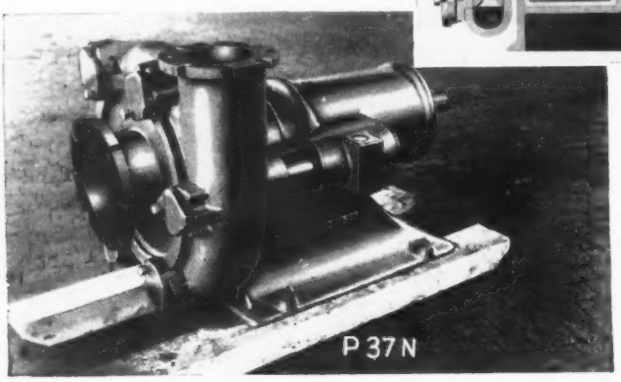
"We have been using for the past six or seven years a 4" rubber lined pump. The lining was entirely unsatisfactory due to the short life of the rubber and continual replacement. We then changed this pump over to a nickel steel alloy shell, and eliminated the rubber lining by the use of steel wearing plates. However, we were still wearing out a case about every six months and an impeller about every three months, which amounts to a high maintenance cost."

Subsequently an Amsco-Nagle 6″ Type "T," frame 19, manganese steel fitted pump like the unit pictured below was installed in this plant. We are now informed:

"The Amsco-Nagle pump was put into operation in January, 1943 and has operated 2½ shifts (20 hours per day) without trouble. The only replacements (after 11 months) have been a new suction plate and a new impeller. The previous pump operated only about half as many hours daily. The present pump has never been repacked. It was necessary to pack the former pump every few days."

Where abrasive or corrosive liquids are handled, Amsco-Nagle pumps are the economical solution. Ask for Bulletin 940.





Above: sectional view of Amsco-Nagle Type "T" Pump. At left: Type "T" Pump of the design used to handle coal washery slurry.

Send for Bulletin 941-W on Amsco Conservation Welding Rods.

Amsco
AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Illinois

AMERICAN Brake Shoe COMPANY

FOUNDRIES AT CHICAGO HEIGHTS, ILL.; NEW CASTLE, DEL.; DENVER, COLO.; OAKLAND, CALIF.; LOS ANGELES, CALIF.; ST. LOUIS, MO.
OFFICES IN PRINCIPAL CITIES

EQUIPMENT APPROVALS

Three approvals of permissible equipment were issued by the U. S. Bureau of Mines in March, as follows:

Jeffrey Mfg. Co.—Gathering-type storage-battery locomotive; Approval 1533; March 4.

Sullivan Mchy. Co.—Type 11B shortwall mining machine; 35-hp. motor, 250 and 550 volts, d.c., or 50-hp. motor, 250 volts, d.c.; Approvals 499 and 499A; March 17.

Sullivan Mchy. Co.—Type 11B shortwall mining machine; 35- or 50-h.p. motor, 220 and 440 volts, a.c.; Approvals 500 and 500A; March 18.

Full-Time Workers To Get Awards

Inside and outside workers of Island Creek Coal Co., Marianna Smokeless Coal Co. and Pond Creek Pocahontas Co., operating in southern West Virginia, have been eligible since March 1 for rewards to be given by the companies to full-time workers. The individual award is a white safety cap with a red, white and blue shield on one side and the inscription "Service Award" on the other.

As the service period grows longer, without loss of a day on which the mine operates, additional credit will be given in the form of chevrons for specified periods. A final credit will be a silver bar attached to the cap. According to J. J. Foster, assistant to vice president and general manager, the rewards will designate "the workers who earn them as regular workers deserving of special credit for their contribution to the war effort."

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Obituary

DAVID F. FAUST, 88, formerly general manager, United Pocahontas Coal Co., Crumpler, W. Va., died March 31 at his home in Shamokin, Pa. He had been ill a few days but his death was unexpected. For many years he was engineer and superintendent for the Philadelphia & Reading Coal & Iron Co.

ALFRED SWORD, 76, chief coal inspector for the Lehigh Valley Coal Co., by which he had been employed 58 years, died April 9 at his home in Wyoming, Pa.

L. C. SKEEN, 51, vice president and general manager, Eastern Coal Corp., operating in Pike County, Kentucky, died April 11 in a Huntington (W. Va.) hospital after an illness of several weeks. He became identified with the Fordson Coal Co. mines in 1926, becoming vice president of the Pond Creek properties soon after they were acquired by the Eastern Coal Corp.

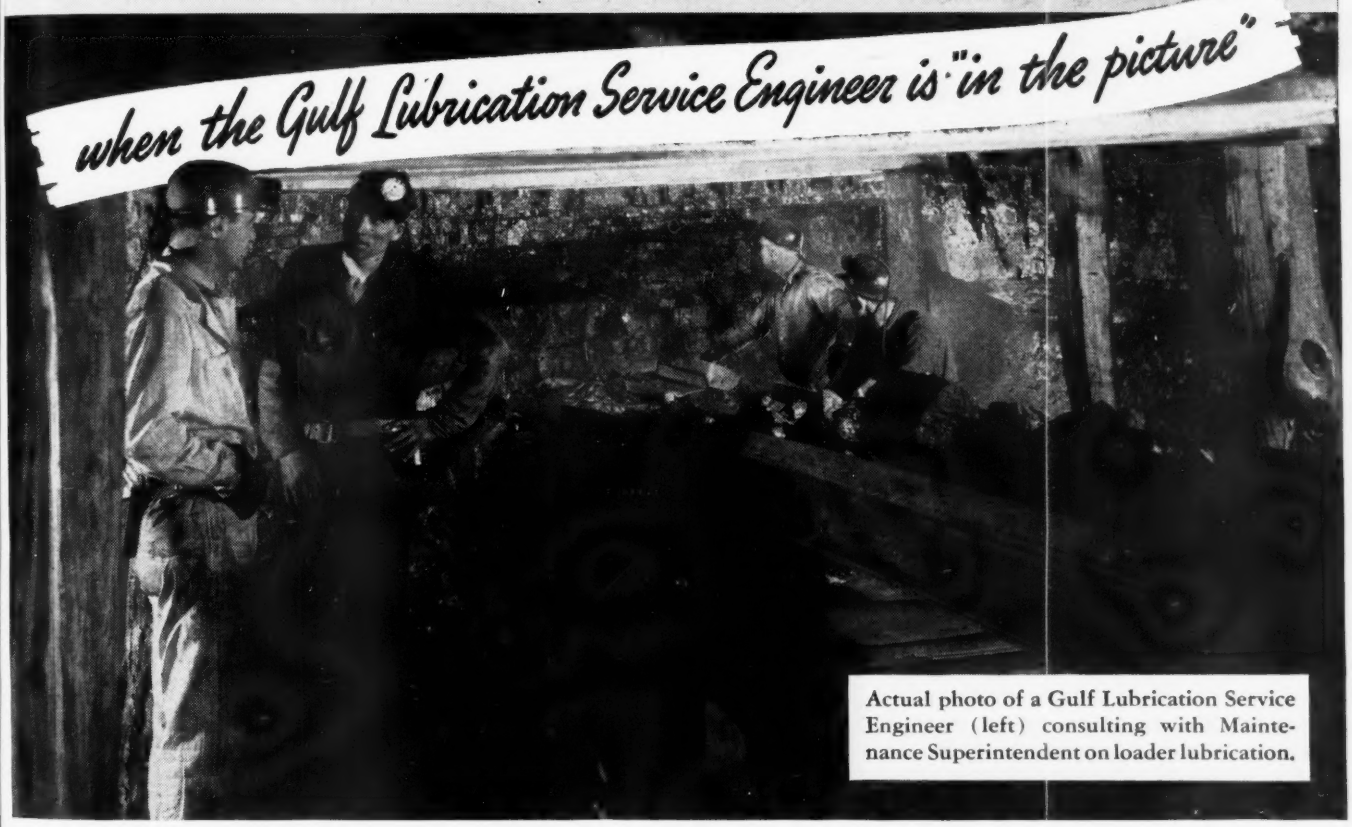
HARRADON S. SMITH, 77, consulting engineer, died April 9 at his home in Forty Fort, Pa. He began his engineering career in 1885 with the Lehigh Valley

Better lubrication . . .

Lower maintenance costs . . .

Less time out for equipment . . .

when the Gulf Lubrication Service Engineer is "in the picture"



Actual photo of a Gulf Lubrication Service Engineer (left) consulting with Maintenance Superintendent on loader lubrication.

The effectiveness of mining machine lubrication has a direct bearing on tonnage produced and on costs for maintenance and power. That's why a majority of leading mines keep a Gulf Lubrication Service Engineer "in the picture," and follow his helpful advice on their lubrication and maintenance problems.

By recommending the proper application of the right oils and greases for every moving part, Gulf Lubrication Service Engineers help to lessen wear, keep equipment on the job, increase efficiency, cut maintenance and power costs, and improve production. *They are specialists in scientific coal mine lubrication!*

Let a Gulf Service Engineer assist your operating and maintenance men in placing the lubrication of your equipment on the most efficient basis possible. It is more than likely that improvements can be made. Write, wire, or phone your nearest Gulf office today.

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GULF REFINING COMPANY
Gulf Building, Pittsburgh 30, Pa.

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BUY *MORE* WAR BONDS!

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Efficient, dependable equipment is essential to fast, safe mining. Duff-Norton Jacks help you keep production up by providing mechanical muscles to help with lifting, lowering, pushing and pulling.

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Coal Co., and later was consulting engineer for the Buffalo, Rochester & Pittsburgh Coal Co.

THOMAS ENGLISH, for many years employed by the Illinois Department of Mines and Minerals, died April 3 at his home in Springfield, Ill.

WILLIAM TURNBLAZER, 57, for nearly 22 years president of District 19, United Mine Workers, died April 22 at his home in Jellico, Tenn. Entering the mines as a boy, he joined the U.M.W. when he was 12, leaving the mines as a young man to become a union organizer and being made an international representative in 1917. Five years later he was named president of District 19, succeeding S. A. Keller. He was a member of the U.M.W. international board and of the joint Appalachian wage conference.

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Association Activities

INDIANA COAL PRODUCERS' ASSOCIATION has reelected as president R. H. Sherwood, president, Central Indiana Coal Co., Indianapolis. Others elected were: vice president, Fred S. McConnell, Cleveland; secretary-treasurer, Michael Scollard; executive board members, J. B. F. Melville, Danville, Ill.; Hugh B. Lee, Terre Haute, and H. S. Richards, Boonville.

WEST VIRGINIA STRIP MINING ASSOCIATION, with headquarters in Clarksburg, W. Va., was organized April 5, with John Paul Keeley as president and the following directors: C. P. Ingram, J. B. Williamson, L. C. Basham, Sidney Smith, Herschel Parsons and Harold F. Sargent. P. J. Walsh, Charleston, executive secretary, West Virginia Contractors' Association, was named temporary secretary.

NORTHERN WEST VIRGINIA COAL ASSOCIATION has elected the following officers: president, George S. Brackett, Consolidation Coal Co., vice William Findlay, Simpson Creek Collieries Co., resigned; vice president, T. J. Johnson, Rosedale Coal Co., vice Joseph Arkwright, Arkwright Coal Co., resigned; secretary-treasurer, T. E. Johnson (reelected).

OHIO COAL ASSOCIATION reelected R. L. Ireland Jr. as president at its annual meeting April 17 at Cleveland. Other officers named are: vice president, E. H. Davis; executive vice president, Ezra Van Horn; secretary-treasurer, E. H. Miller; assistant secretary-treasurer, F. H. Bohecker. Guests at the luncheon included F. S. McConnell, president, National Coal Association, and C. J. Potter, Deputy Coal Mines Administrator, the latter giving a talk on the manpower problem. John Battle, executive secretary, N. C. A., spoke at the afternoon session.

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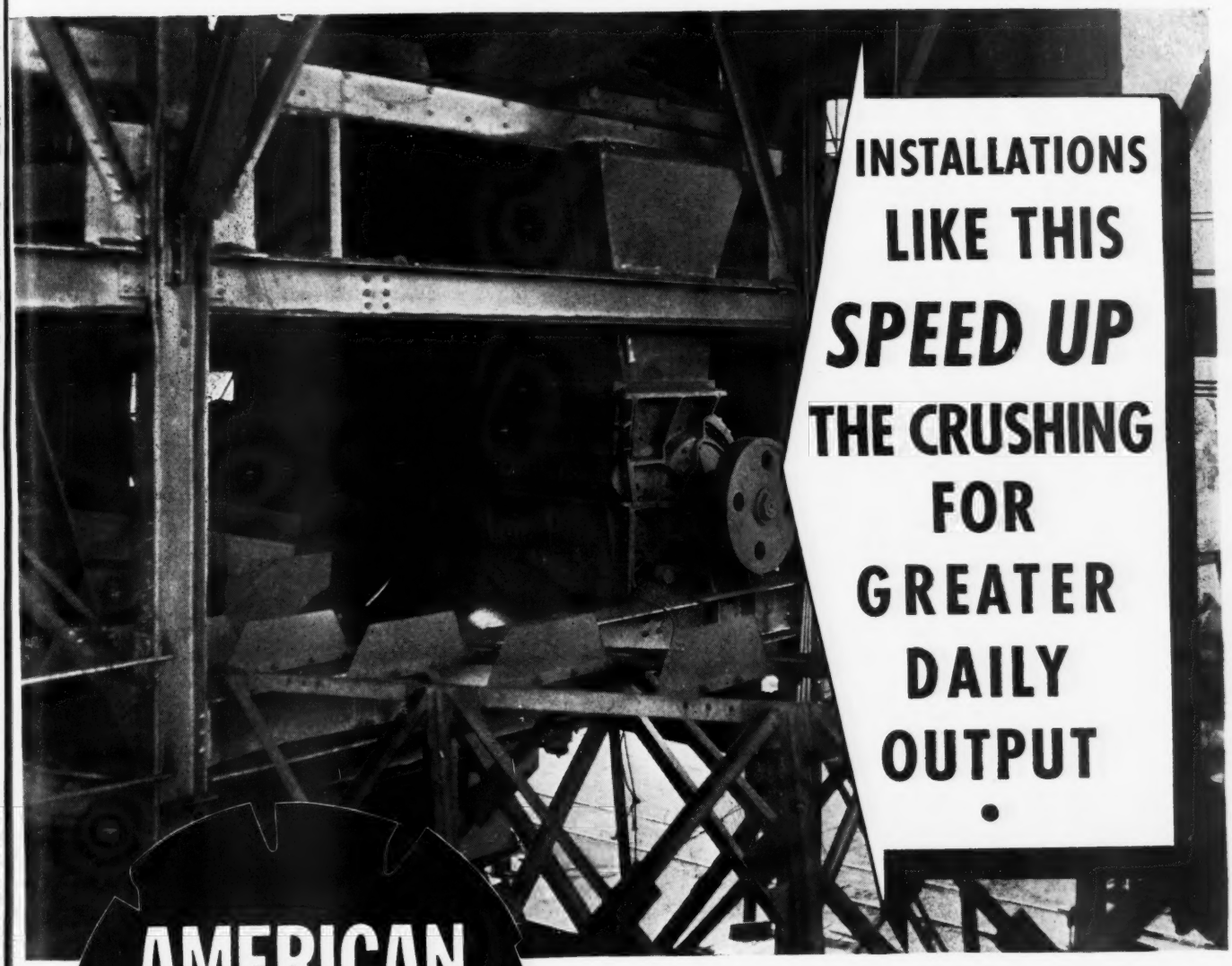
Personal Notes

J. J. KAISER has retired as mechanical engineer with the Glen Alden Coal Co., Scranton, Pa., after 37 years in that department. He started with the Lehigh & Wilkes-Barre Coal Co. as mail boy during



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● The splitting action of the SHREDDER RINGS shatters and distributes the coal before it reaches the Breaker and Grinding Plates.

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● You can economically provide for immediate large tonnage crushing and for post war requirements. At the same time you get the assurance of uniform sizes for either stoker or pulverizer coal. In service for many mines the American Rolling Ring Crusher demonstrates its ability to crush coal at a total of less than one cent per ton, including power, labor, maintenance, and interest on investment. The splitting action of our patented manganese steel shredder rings reduces fines to a minimum—the coal is split instead of being crushed.

There's a type of unit exactly applicable to your requirements. Let us make recommendations based on our long and wide experience. Each crusher is guaranteed for the job—each is compact, externally adjusted—easily accessible.

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The high efficiency and reliability of De Laval worm gears is especially valuable in continuous, 24-hour service. The efficiency approaches 97 per cent at some ratios and increases, rather than recedes, with use. Power is transmitted without vibration, chatter or shock. The only maintenance required is occasional inspection of the oil level in the casing.

The driven shaft can be extended to either right or left, or both, or either up or down, or both.

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of the De Laval Steam Turbine Co., Trenton, N. J.
MANUFACTURERS OF TURBINES · STEAM HYDRAULIC PUMPS · CENTRIFUGAL PROPELLER ROTARY DISPLACEMENT · MOTOR MOUNTED MIXED FLOW CLOGLESS SELF PRIMING CENTRIFUGAL BLOWERS and COMPRESSORS GEARS · WORM HELICAL and FLEXIBLE COUPLINGS

summer vacation in 1898 and became a clerk in the operating department a year later. Entering Pennsylvania State College in 1902, he was graduated with the class of 1906 in mechanical engineering and returned to the coal company as assistant mechanical engineer.

S. K. Hissom Jr., superintendent, Banning Nos. 1 and 2 mines, Pittsburgh Coal Co., has been promoted to division superintendent in charge of five mines and a central cleaning plant near Houston, Pa.

L. S. Horne, mine foreman at Banning No. 1 mine, Pittsburgh Coal Co., has been advanced to superintendent of Banning Nos. 1 and 2.

Coulter O'Neill has been appointed mine foreman at Banning No. 1 mine, Pittsburgh Coal Co., Van Meter, Pa.

E. B. Winning, manager since 1933 of Republic Steel Corp. northern coal mines and 26 years with the firm, has been appointed assistant to C. M. White, vice president in charge of operations. In his new role Mr. Winning will supervise all of Republic's mining activities from Cleveland headquarters. He joined the company in 1918 as electrical and mechanical engineer in its Pennsylvania mines. In 1932 he was appointed assistant district manager, and the following year district manager.

Nathaniel Kirk, mine foreman at Lindley mine, Pittsburgh Coal Co., Houston, Pa., has been transferred to Montour No. 4 mine to act in the same capacity.

Charles Klink, assistant production engineer, Pittsburgh Coal Co., has been promoted to mine foreman at Lindley mine, Houston, Pa.

J. L. Hamilton, assistant northern district manager of mines, Republic Steel Corp., has been advanced to district manager, vice E. B. Winning, promoted. Mr. Hamilton has been with the company for ten years.

Walter Jaap, mine inspector, Pittsburgh Coal Co., has been promoted to superintendent at Midland mine, Houston, Pa.

Thomas Kagle, superintendent, Mongah mine, Pittsburgh Coal Co., Monongahela, Pa., has retired because of ill health after having been with the company since its organization in 1899.

W. J. German, general superintendent, Pocahontas Fuel Co., Pocahontas, Va., left April 15 for Washington to report for Army duty with the rank of colonel. An explosives expert, Mr. German served overseas in World War I.

M. F. Florjancic, supervisor of leased mines, Pittsburgh Coal Co., has been advanced to mine foreman at the newly opened Mingo mine.

W. J. Rude, assistant production engineer, Pittsburgh Coal Co., has been promoted to mechanical mining engineer in the production engineering department.

Keith D. Proor has been appointed Deputy Chief of the Coal Section of WPB's Mining Division, vice William

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It's the Power and Speed that Counts . . . Koehring speed and power saves seconds in shovel operations . . . the surest way to increase production. Victory demands a greater output, and Koehring Shovels have the reserve power to provide it. The wartime service needed is available in your Koehring Shovel with little time out for breakdown or repair. Be sure to keep your shovel well lubricated . . . replace worn parts before failure . . . never misuse your shovel in any way . . . and it will exhibit a performance that counts in increasing production.

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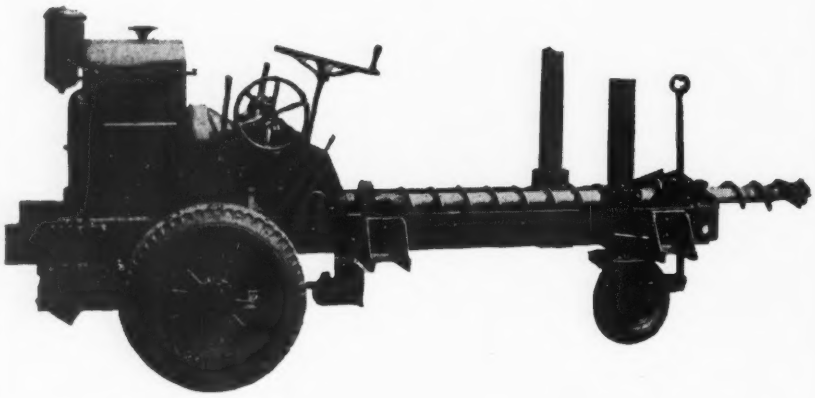
Parmanco Horizontal Drills give you "Positive Control Drilling." Parmanco Vertical and Horizontal Drills are today's leaders in low cost, low maintenance drilling—All Parmanco Drills are equipped with patented Parmanco augers. Used by leading strip mine operators—Write us your drilling problems.



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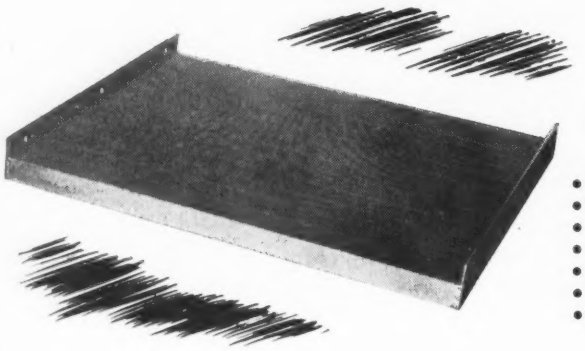

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M. Wheeler, who resigned to accept a position with the H. C. Frick Coke Co. Mr. Pfoor, connected with the Mining Division since March, 1942, was a technical adviser on coal priorities.

William W. Martin, ventilation supervisor, has been appointed inside foreman at Grassy Island mine, Olyphant colliery, Hudson Coal Co., Olyphant, Pa., vice Alex Frew, retired.

D. C. Ridenour, assistant to the superintendent at Somers mine, Pittsburgh Coal Co., has been promoted to cost control supervisor in the production engineering department.

Ralph W. Smith, sectional foreman, Grassy Island mine, Olyphant colliery, Hudson Coal Co., Olyphant, Pa., has been made ventilation supervisor, vice Ralph W. Martin, transferred.

Frank Strimlan, superintendent at Solar mine, Pittsburgh Coal Co., McDonald, Pa., has been transferred to Crescent mine as superintendent.

John Alderson, superintendent, Montour No. 9 mine, Pittsburgh Coal Co., McDonald, Pa., has been appointed to act in the same capacity at Solar mine, operations of which have been combined with those of Montour No. 9.

Locomotive Bearings Discussed in Illinois

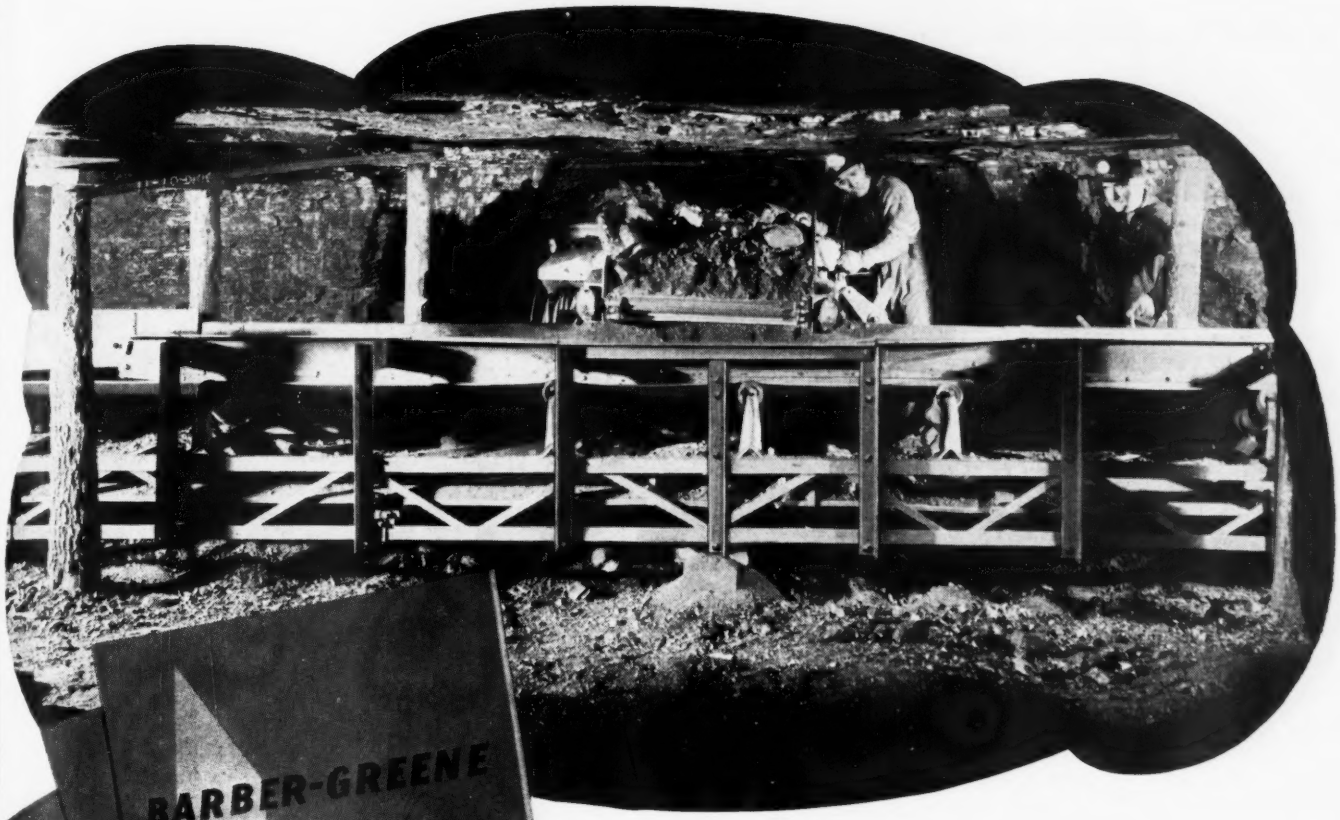
"Knowing your bearings pays big dividends. Select the best, protect and maintain them." So declared A. A. Van Pelt, engineer, Norma-Hoffmann Bearing Corp., before the April meeting of Mining Electrical Group, West Frankfort, Ill.

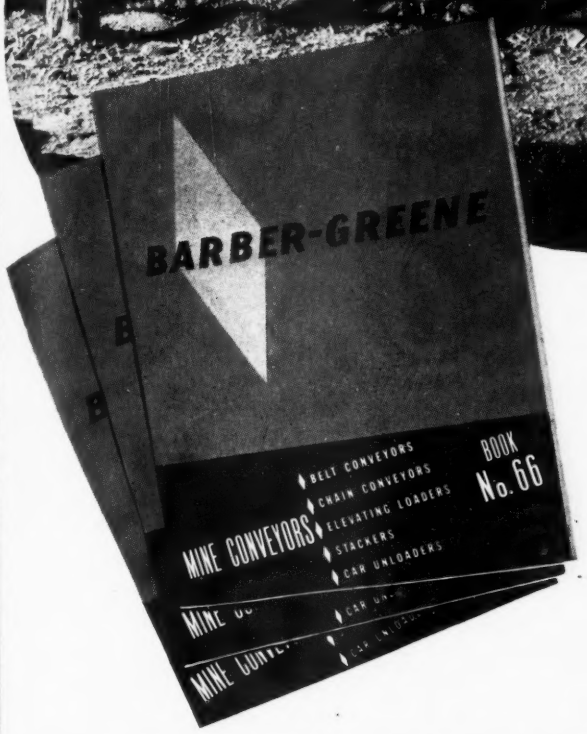
Early ball bearings, Mr. Van Pelt pointed out, were housed in leaky containers which admitted sand and dirt, and the thin, pressed-steel retainers with spherical ball pockets held this grit so it ground down the bearing surfaces and destroyed the retainers. The balls might still be serviceable and so the life of such a bearing could be prolonged with a new ball retainer.

Solid bronze with cylindrical ball pockets make the best retainer. Bronze has less friction than steel. The balls do not have to carry the retainer and are freed from friction. The cylindrical ball pockets do not retain grit, so there is less abrasion to the balls. Such a ball bearing has good thrust qualities.

The commutator end bearing of a mine locomotive is solidly clamped in place and takes all the thrust. The pinion end bearing must be free for shaft and frame expansion. It takes no thrust. The Norma-Hoffmann recommendation for these two locations is a deep-groove single-row ball bearing for the commutator end, to take the thrust, and a cylindrical floating roller bearing for the pinion end, to take the pressure of the gears and the shock of the load.

Normally, this type of roller bearing does not take all the space in the framehead. The void should be filled with a spacer or by welding and remachining. When changing over to roller bearings, if a





MINE CATALOG AVAILABLE

The entire line of Barber-Greene standardized mine conveying equipment is presented in "Mine Conveyors, Book No. 66", just published.

Covered in the catalog are B-G standardized sectional conveyor frames, drive ends and takeups, carriers, stackers and car unloaders. Two typical conveyor mine workings are shown in large scale as suggestions in adapting new or existing mines to the economy and high capacity of conveyor transportation.

Profusely illustrated with photographs of underground installations, dimension drawings of the individual units, and stockpiling layouts, the catalog can be used in your individual modernization planning.

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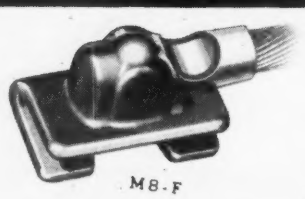
MESCOWELD Rail Bonds for Consistently High Voltage

★ Without efficient bonding, motors are weak, voltage is low, and amperes high. As a result, motors overheat and sometimes roast the insulation. This usually means expensive electrical repair bills and loss of tonnage.

It pays to use Mescoweld Rail Bonds. They guarantee added strength throughout the circuit because of their flash-welded construction.

Write for catalog No. 44 on Mosebach Mine Supplies



M8-F

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1115 Arlington Ave., Pittsburgh 3, Pa.

framehead is worn it should be brought to original dimensions by spraying or welding and machining. The framehead should be true and the machined surfaces concentric. Warping may be prevented by preheating before welding.

Bearing inclosures must be of the labyrinth type, double. A single labyrinth will not keep all the dirt out. A good inclosure of this type will prolong the life of bearings to three or four times. Some records double that.

"War scarcity makes careful attention to bearings necessary," said Mr. Van Pelt in outlining procedures that prolong life and aid in salvaging bearings. New bearings should be stored in the original package. Do not wash them or remove the slushing compound.

Never use a file to true or size a shaft. They are not round or to size. The inner race of the bearing on armature shafts so treated will become loose and the bearing fail. Use a tool-post grinder to make such fits.

When making an assembly be cautious. It is important not to get the bearing cocked on the shaft. When mounting a new bearing use an arbor press or heat the bearing to 200 deg., preferably in an oil bath. Transfer it quickly and push it in place. When nearly in place it may be driven tight with a pipe.

A small special room is recommended for reclaiming used bearings. The principal accessory is a solvent tank with a perforated false bottom to work on. The solvent is circulated with a small centrifugal pump. A filter should be added to separate the dirt and caked grease. For badly oil-caked bearings, use high-pressure air and solvent alternately. Air causes rust and should be used only where solvent fails.

For short storage, coat with vaseline; wrap in oil-resistant paper. A slushing compound may be made of 75 percent petrolatum and 25 percent oil.

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Coal Publications

Fuel Savings Resulting From Closing of Rooms and From Use of a Fireplace, by Seichi Konzo and W. S. Harris, University of Illinois, Urbana, Ill. Bulletin Series No. 348, 36 pp., 6x9 in.; paper. Price, 40c. When heat input from gas or oil burner much exceeded heat loss from house, closing a fourth of the house saved little fuel. With heat input corresponding to heat loss some small fuel saving was effected by closing one-fourth of living quarters. Fireplace also proved of moderate assistance.

Coal-Mine Explosions and Coal- and Metal-Mine Fires in the United States During the Fiscal Year Ended June 30, 1943, by D. Harrington and W. J. Fene, U. S. Bureau of Mines. I. C. 7274, 27 pp., 8x10½ in.; mimeograph; paper. During the last five years more men were killed by mine explosions than died from the same cause during all the preceding eight years.

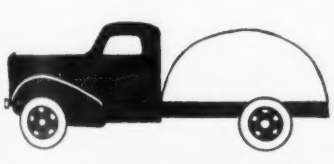
Performance of a Hot-Water Heating System in the I-B-R Research Home at University of Illinois, by A. P. Kratz, W. S. Harris, M. H. Fahnestock and R. J. Martin,

100% MORE PAYLOAD

ON YOUR OWN (or a new) 1½-2 ton MEDIUM TRUCK

IDEAL EQUIPMENT FOR COAL HAULING

Coal is as vital as bullets for successful execution of the war. Yet heavy trucks, so necessary for its transportation from mines and to users, present a serious problem as they become more and more scarce. *That's* where Thornton steps in to help you . . . by converting your used (or new) 1½-2 ton medium trucks into specially engineered six-wheel, heavy duty trucks . . . capable of hauling 100% *more* payload over tough "off-the-road" conditions, and for speedy, economical city delivery. These Thornton conversions are readily available without priority. Write for full particulars.



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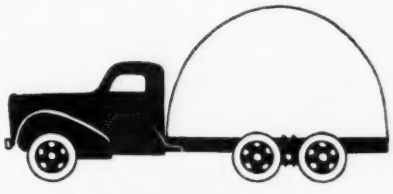

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- ✓ Carry 100% *more* pay load
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- ✓ A Thornton engineered job out-pulls, out-lasts, out-maneuvers standard trucks costing double or more
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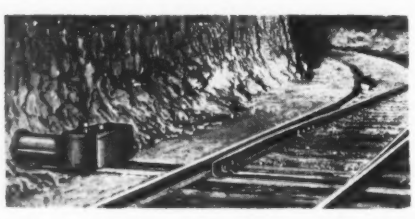
The "Mighty Midget" was designed particularly for work at the mine face and for quick conveyance on coal cars, shuttle cars, from point to point where immediate dusting is needed to assure safety. Let us demonstrate this "Mighty Midget Dustributor" in your mine. It will quickly pay for itself. Will distribute one ton of dust per hour.



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Does everything a switchman can do and does it faster with safety. Automatically throws switch points ahead or behind trip—or both. Trip maintains full speed. Switch can be operated by motorman, remote control or by hand and is adapted for use with automatic DERAILER.

SIGNALS . . . warn interfering trips and clear the way for non-stop main line trips. Prevent collisions and enable all trips to move with safety and speed.

Write for catalogues of these self-paying safety devices.

THE AMERICAN MINE DOOR CO.

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University of Illinois, Urbana, Ill. Bulletin Series No. 349, 74 pp., 6x9 in.; paper. Price, 75c. Studies of fuel and power savings and room-temperature conditions resulting from reducing room-air temperatures at night. More heat came from chimney and uninsulated heating pipes, lights and occupants than from radiators. About 80 percent of heat in fuel burned was available in house.

The Mining Industries 1899–1939: A Study of Output, Employment and Productivity, by H. Barger and S. H. Schurr, National Bureau of Economic Research. 452 pp., 6x9¼ in.; cloth. Price, $3. Bituminous coal mining receives 20 pp. and anthracite 8 pp. "Many other branches of mineral extraction have made more rapid progress during the past 40 years than has bituminous coal.

Directory of the American Council of Commercial Laboratories. Executive Secretary, A. J. Nydick, 62 Wall St., New York, N. Y. "A guide to the leading independent testing, research and inspection laboratories of America."

Coal Mine Directory, 1943–4, United States and Canada, Reprint from Coal Buyers' Manual, McGraw-Hill Publishing Co., Inc. 228 pp., 8½x11 in.; cloth. Price, $7.50.

Accidents to Children From Blasting Caps, by D. Harrington and R. G. Warncke, U. S. Bureau of Mines. I. C. 7275, 13 pp., 8x10½ in.; mimeograph; paper. Gives several examples of accidents to children from this cause during 1943, and urges more care in keeping children from getting such caps and teaching children at school and elsewhere to recognize and avoid them.

Annual Report of Research and Technologic Work in Coal, Fiscal Year 1943, by A. C. Fieldner, J. E. Beltz and P. L. Fisher, U. S. Bureau of Mines. I. C. 7272, 77 pp., 8x10½ in.; mimeograph; paper.

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Mine Fatalities Recede Slightly

Accidents at coal mines of the United States caused the deaths of 66 bituminous and 21 anthracite miners in February last, according to reports furnished the U. S. Bureau of Mines by State mine inspectors.

With a production of 52,740,000 net tons, the accident death rate among bituminous miners in February last was 1.25 per million tons, compared with 1.56 in the preceding month and 3.60 in February, 1943.

The anthracite fatality rate from accidents in February last was 3.58, based on an output of 5,869,000 tons, against 2.86 in the preceding month and 2.70 in the second month of 1943.

For the two industries combined, the accident fatality rate in February last was 1.48, compared with 1.67 in the preceding month and 3.51 in February a year earlier.

Fatalities during February last, by causes and states, as well as comparable rates for the first two months of 1943 and 1944, were as follows:

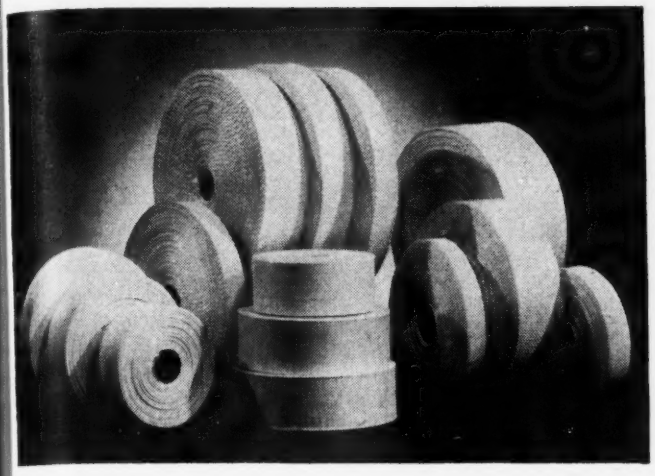
UNITED STATES COAL-MINE FATALITIES, FEBRUARY, 1944, BY CAUSES AND STATES

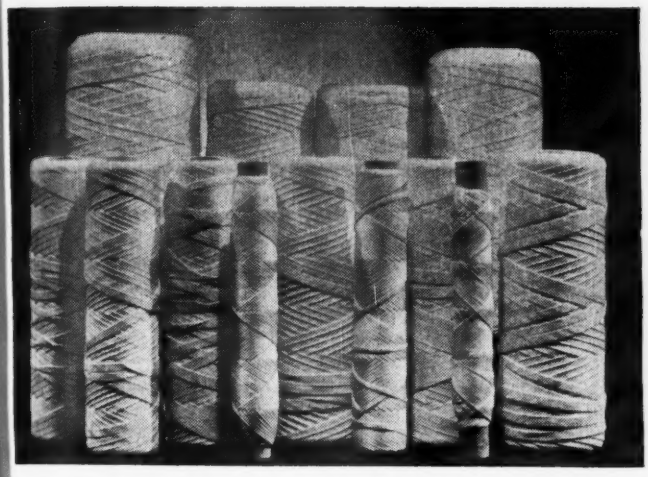
	Underground										
State	Falls of Roof	Falls of Face	Haulage	Explosives	Electricity	Machinery	Other Causes	Total Underground	Opencut	Surface	Grand Total
Alabama	2	..	1	..	..	..	..	6	..	..	8
Colorado	..	..	1	..	..	..	..	3	..	..	3
Illinois	3	2	1	..	..	..	..	6	..	..	6
Indiana	..	..	1	..	..	..	..	1	..	1	2
Kentucky	5	1	3	..	..	..	..	9	..	..	9
Ohio	2	..	1	..	..	..	1	4	1	..	5
Pennsylvania (bituminous)	4	..	3	..	1	1	..	9	..	..	9
Tennessee	1	..	..	..	..	..	..	1	..	..	1
Utah	1	..	1	..	..	..	..	2	..	1	3
Virginia	2	..	..	..	1	..	..	3	..	..	3
West Virginia	13	..	4	..	..	1	..	18	..	..	18
Wyoming	..	..	..	..	..	1	..	1	..	..	1
Total bituminous	38	3	16	..	2	3	1	63	1	2	66
Pennsylvania (anthracite)	12	..	1	2	..	..	2	17	1	3	21
Grand total	50	3	17	2	2	3	3	80	2	5	87

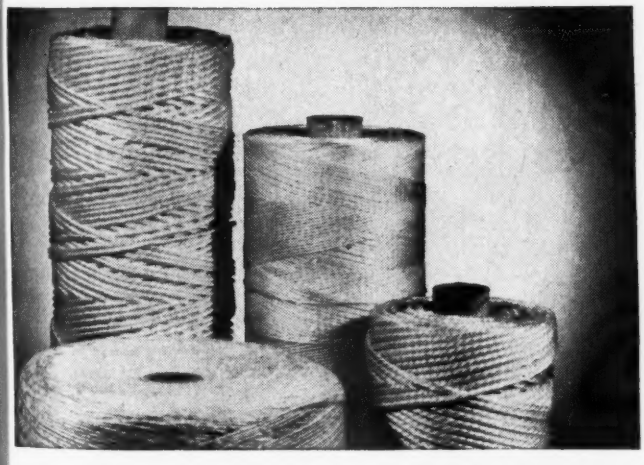
DEATHS AND FATALITY RATES AT U. S. COAL MINES BY CAUSES OF ACCIDENTS*
January-February, 1943 and 1944

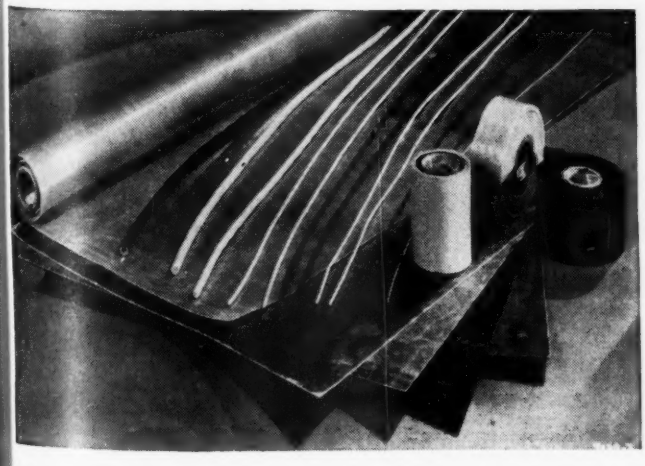
	Bituminous				Anthracite				Total			
	Number Killed		Killed per Million Tons		Number Killed		Killed per Million Tons		Number Killed		Killed per Million Tons	
Cause	1943	1944	1943	1944	1943	1944	1943	1944	1943	1944	1943	1944
Underground:												
Falls of roof and coal	113	88	1.165	0.826	9	18	0.936	1.652	122	106	1.144	0.903
Haulage	41	37	.423	.347	6	4	.623	.367	47	41	.441	.349
Gas or dust explosions:												
Local	4	....	.041	....	....	1	....	.092	4	1	.037	.009
Major	74	....	.763	....	....	....	....	....	74	....	.694	....
Explosives	11	1	.113	.009	2	5	.208	.459	13	6	.122	.051
Electricity	2	4	.021	.037	....	....	....	....	2	4	.019	.034
Machinery	4	7	.041	.066	....	....	....	....	4	7	.037	.060
Shaft	2	2	.021	.019	....	....	....	....	2	2	.019	.017
Miscellaneous	13	2	.134	.019	2	2	.208	.183	15	4	.141	.034
Stripping or open-cut	11	3	.113	.028	1	1	.104	.092	12	4	.113	.034
Surface	11	7	.113	.066	2	4	.208	.367	13	11	.122	.094
Total	286	151	2.948	1.417	22	35	2.287	3.212	308	186	2.899	1.586

* All figures subject to revision.









Fiberglas* properties

—helpful in solving problems in electrical insulation

Fiberglas is glass. It will of itself withstand temperatures far in excess of any requirements of an electrical insulation. But high heat resistance is only one of its many basic properties.

Low space factor (thinness) combined with high tensile strength make Fiberglas highly desirable in many applications in which its high-temperature characteristic has value only as a safety factor . . . In textile form, Fiberglas is available in thicknesses down to 2 mils (.0020″).

Fiberglas is resistant to moisture, most acids, oils, corrosive vapors. Again, these properties make it highly desirable for electrical use where high heat resistance is important only as a safety factor.

In textile form, Fiberglas is a good conductor of heat. This property also permits its use in many electrical applications.

And, of course, Fiberglas is permanent. It does not deteriorate with age.

Treated and Untreated Forms

Untreated Fiberglas is available as cloth, tapes, sleeving, and cord.

In treated forms, Fiberglas is available as varnished cloth and tapes; combination Fiberglas-and-mica sheets and tapes; pressure-sensitive tapes; single, double, and triple saturated sleeving; varnished tubing; and laminated Fiberglas sheets, sticks, or wedges.

Fiberglas-covered magnet wire, lead wire, and other wires are obtainable from leading wire manufacturers.

Fiberglas is now available for immediate delivery. Increased production facilities make this possible. Consult your electrical distributor. *Owens-Corning Fiberglas Corporation, Toledo 1, Ohio, Fiberglas Canada, Ltd., Oshawa, Ont.*

FIBERGLAS

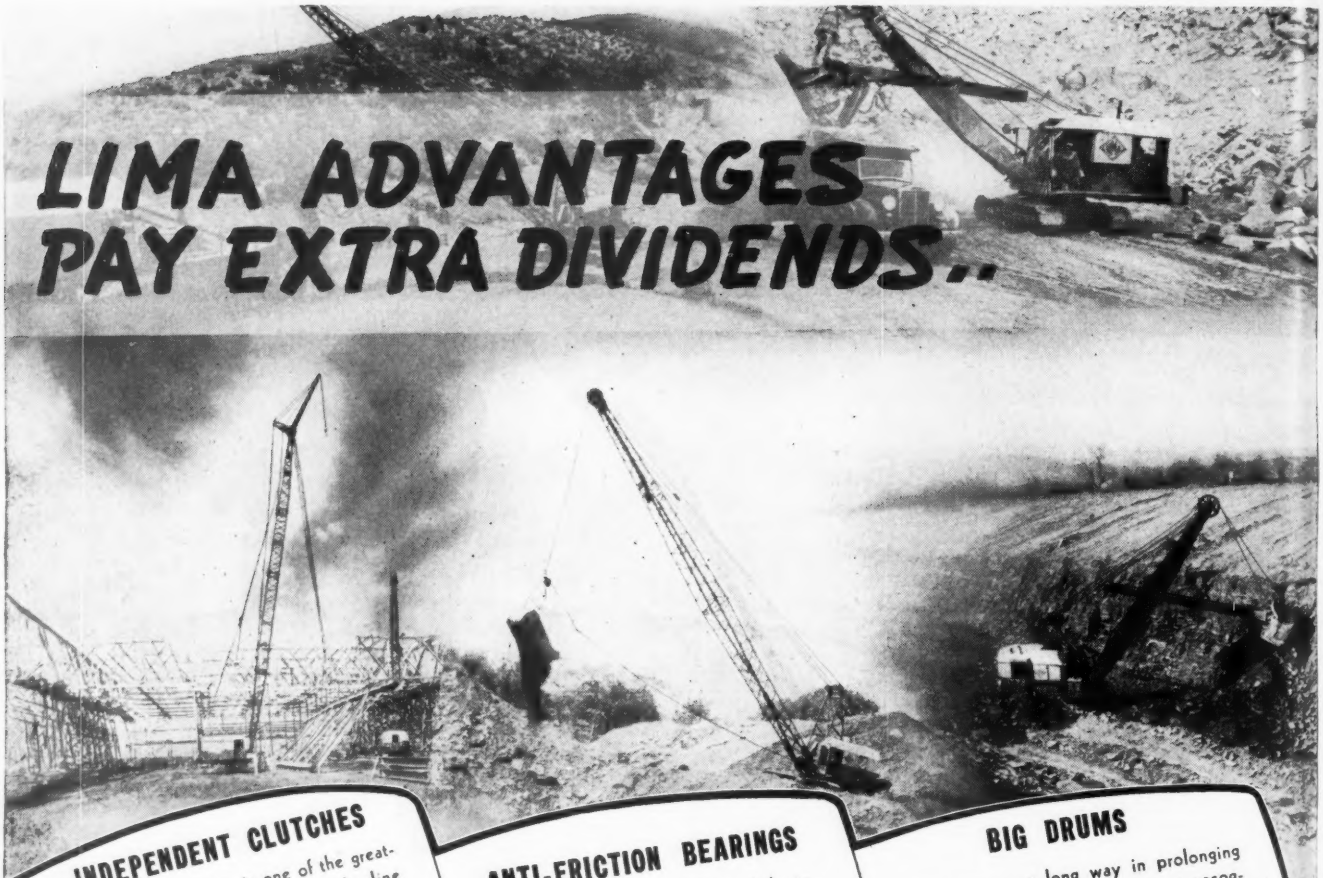
*T. M. Reg. U. S. Pat. Off.

ARMY (E) NAVY

YARNS • TAPES • CORD • SLEEVING

CLOTH and OTHER FORMS

LIMA ADVANTAGES PAY EXTRA DIVIDENDS..



INDEPENDENT CLUTCHES

Independent clutches is one of the greatest advantages a crane, shovel or dragline can have. LIMA cranes, shovels and draglines can hoist, swing, travel and boom up or down at the same time. Imagine the saving in time and convenience of such a feature when working in close quarters.

ANTI-FRICTION BEARINGS

Anti-friction bearings not only help to reduce friction and conserve fuel but they also keep shafts in proper alignment thus assuring a smoother running and longer lived machine.

BIG DRUMS

Big drums go a long way in prolonging cable life. Cable manufacturers recognize the injury to the cable if too small a drum is used. Therefore they recommend that drum diameters be not less than 30 times the diameter of the cable used. LIMA drums in most cases either meet or exceed these recommendations.

There are many good reasons why LIMA Cranes, Shovels and Draglines are doing such a fine job here and at the war front. They are rugged and strong, built to match whatever job there is to do. Independent clutches, big drums, anti-friction bearings and other modern features help keep the job moving at top speed.

Low cost operation, big output under adverse conditions and long dependable service assures complete satisfaction and pride in ownership. Consider these advantages when you plan your future excavating and material handling needs. Remember the name, LIMA, foremost in crane, shovel and dragline design.

LIMA LOCOMOTIVE WORKS, INCORPORATED

Shovel and Crane Division — LIMA, OHIO, U. S. A.

NEW YORK, N. Y. PHILADELPHIA, PA. NEWARK, N. J. MEMPHIS, TENN. ST. LOUIS, MO. DALLAS, TEXAS PORTLAND, ORE. MINNEAPOLIS, MINN.
SEATTLE, WASH. SAN FRANCISCO, CALIF LOS ANGELES, CALIF. SPOKANE, WASH. MONTREAL Quebec, Can. VANCOUVER, B. C.

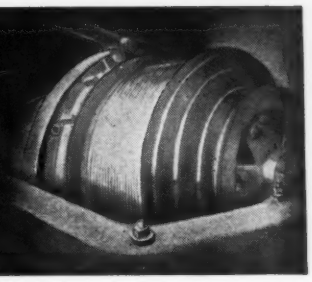
CRANES 13 TONS TO 100 TONS CAPACITY — VARIABLE DRAGLINES

LIMA

SHOVELS ¾ YARD TO 5 YARDS CAPACITY — PULL-SHOVELS

A TYPE AND SIZE FOR EVERY MATERIAL HANDLING JOB

TIPS FROM MANUFACTURERS



Safety Goggles

Two new AO Ful-Vue acetate safety goggles, made extremely light in weight without sacrificing strength, are offered by the American Optical Co., Southbridge, Mass. Strongly constructed, the goggles have a more massive front than ordinary acetate goggles pattened after zylonite spectacles, according to the manufacturer. The groove in the lens rim is deep, forming a lens seat with substantial backing to resist impact. The bridge is made of extra heavy stock, with a slight amount of face form to provide added side protection. Nose pads, also made of very heavy stock, have well-rounded edges and ample flare

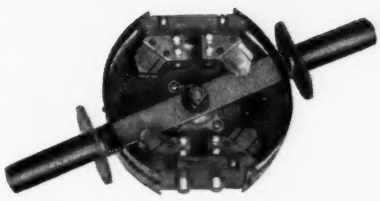
to withstand jolts and blows—without digging into the face of the wearer.

If properly fitted, the goggle's comfort cable temples, says the maker, will hold the goggles snugly in position, thus preventing any tendency for the goggle to slide forward on the nose. Three styles are available, all with Super Armorplate lenses —one in a pink crystal color with white or Calobar lenses, the second fitted with side shields and also in pink crystal color or in green.

•

Signal Switch

Mosebach Electric & Supply Co., 1130 Arlington Ave., Pittsburgh 3, Pa., has perfected a heavy-duty signal switch for safe and efficient underground haulage. An outstanding feature of this signal is said to be its unfailing ability to warn the motorman of existing danger. The switch is wired in series with the signal lights so that if one light fails the entire system fails.

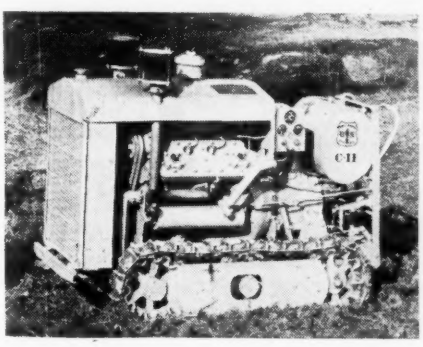


This unit is designed for roof or rib mounting and can be conveniently operated without leaving either motor or trip. The extra heavy contact jaws and switch blades are designed for rough usage. In addition, the Mesco heavy-duty signal switch is easy to install.

•

Compressor

Schramm, Inc., West Chester, Pa., offers Fordair No. 60 compressors consisting of "Mercury" cylinder blocks plus Schramm patented mechanical intake valves, heads and intake manifold, with two power and two air cylinders on each bank. Each unit, it is said, consists of a well-balanced four-cylinder engine, four-cylinder compressor cast en bloc, minus all chains, gears and belts. The result, says



the manufacturer, is a compact, hard-hitting, heavy-duty, lightweight compressor that effects an important saving in critical materials and transportation costs. In addition practically 96 percent of the replacement parts can be obtained from any authorized Ford dealer.

There are two-wheel trailer types as well as skid-mounted, self-propelled rail-car, crawler and stationary models.

•

Fire Extinguisher

National Powder Extinguisher Co., 50 Rockefeller Plaza, New York City, offers the new "All-Out" fire extinguisher, designed especially to extinguish both flammable liquids and fires of electrical origin. According to the manufacturer, the extinguisher ejects a stream of "All-Out" dry chemical which, when activated by heat, forms a dense, fire-smothering cloud over a flaming area up to 18 ft. The insulating qualities of the cloud help guard against reflash and create a heat-deflecting screen between the operator and the flame, it is said, permitting close-range attack with

greater safety and no heat discomfort. The chemical, a non-conductor of electricity, is harmless to humans and delicate mechanized parts of motors or machinery.

Weighing only 37 lb. fully charged, the "All-Out" extinguisher is easily maneuvered by men or women workers. It is fast in action and can be quickly recharged at the scene of a fire without special recharging equipment.

•

Dozer

LaPlant-Choate Mfg. Co., Inc., Cedar Rapids, Iowa, offers a cable-operated "Trailbuilder," designated as Model R-82R, designed for mounting on Caterpillar D-8 tractor. Retaining all the structural features of this company's dozer line—welded steel construction, box channel frame, box plate blade, pressed and formed sections—the cutting edge has been reinforced with more bolts compared with earlier models, while the cutting bits at either end of the

When You Want Longer Service

from bearings and bushings order

PROMET
THE Economical BRONZE

High lead bronzes and specific formulae for each application.

LOCOMOTIVE AXLE LINERS are made from Promet formula #18 which is tough, malleable, and with good wearing characteristics because its strength physicals are combined with a low coefficient of friction. This bronze will withstand the hammering and thrust to which axle bearings are subjected.

LOCOMOTIVE JOURNAL BEARINGS should have a low coefficient of friction and fair "physicals." For these reasons Promet #2-S is used. These Journals will stand up under a large amount of coal dust and other abrasives without cutting or scoring.

MAIN DRIVES ON MINING MACHINES are submitted to extremely heavy duty. Promet #6-SK is ideally suited for these applications.

EXTREMELY HEAVY BEARING DUTIES which are also subjected to impact, are supplied in Promet #89-S or 91-SK.

Parts for Jeffrey, Goodman, Westinghouse, General Electric, Sullivan and Joy Equipment, etc.

THE AMERICAN CRUCIBLE PRODUCTS COMPANY

1307 Oberlin Ave., Lorain, Ohio, U. S. A.

Prompt deliveries can be made from stocks maintained at

BECKLEY, W. VA.,
The Universal Supply Co.,
Corner 2nd Ave. and
2nd St. . . . . Phone 3642

LORAIN, OHIO,
The American Crucible
Products Co. . . . . Phone 6983

WILLIAMSON, W. VA.,
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BIG STONE GAP, VIRGINIA . . C. P. Cawood

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CANTON, OHIO,
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MT. LEBANON, PA.,
J. E. Nieser, 720 Roselawn Ave. . . . . Phone Pittsburgh 9876

ALTON, ILL.,
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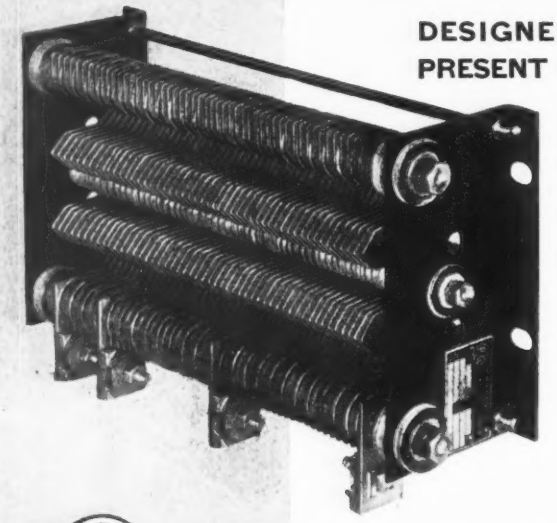
P-G *Steel Grid* RESISTORS

CONSISTENTLY PROVE THEIR VALUE

for MINING MACHINES



DESIGNED TO FIT YOUR PRESENT RESISTOR SPACE

Built of steel and mica—nothing to break—no warping or hot spots—constant in resistance value, regardless of temperature or age. Not affected by vibration, moisture or corrosive fumes. Continuous trouble-free service is assured with . . .

P-G

"The Resistor you can Install and Forget"

THE POST-GLOVER ELECTRIC COMPANY

•ESTABLISHED 1897•

221 WEST THIRD STREET, CINCINNATI, OHIO

blade are single plates formed to fit the ends of the blade for greater wear resistance in rock cuts. The front overhead is a new design for increased strength and better appearance.

An outstanding feature of this unit is said to be its simple and positive operation. The three-position blade can be positively angled either to right or left, or held in straight bulldozing position. Either end of the blade can be tilted up or down with a variation of 14 in. while in straight bulldozing position as well as when the blade is in either angling position. This is accomplished quickly by pulling two pins. The blade can be raised a maximum of 50 in. or dropped 72 in. below the ground line. This movement is accomplished by means of "Caterpillar" double drum power control unit. A single cable is used.

•

Plastics-Rubber Wed

The "marriage" of plasticized vinyl chloride resins with certain butadiene-type synthetic rubbers to effect vulcanizable blends possessing most of the best properties of each material, creating a new and valuable series of elastomers, is announced by B. F. Goodrich Co., Akron, Ohio. Compounds offered by the company, subject to War Production Board allocation, are mixtures of its GEON vinyl resins, recently announced, and Hycar oil-resistant synthetic rubber, in which butadiene and acrylonitrile are principal ingredients.

GEON resins as such will be furnished, with instructions for compounding with oil-resistant synthetic rubber when this is desired. Vulcanizable blends ranging from 75 parts of oil-resistant synthetic rubber such as Hycar OR and 25 parts of the GEON resins to 50 parts of the rubber and 50 GEON are easily processable by well-known rubber-industry techniques and yield products servicable over an exceptionally wide range, the company says.

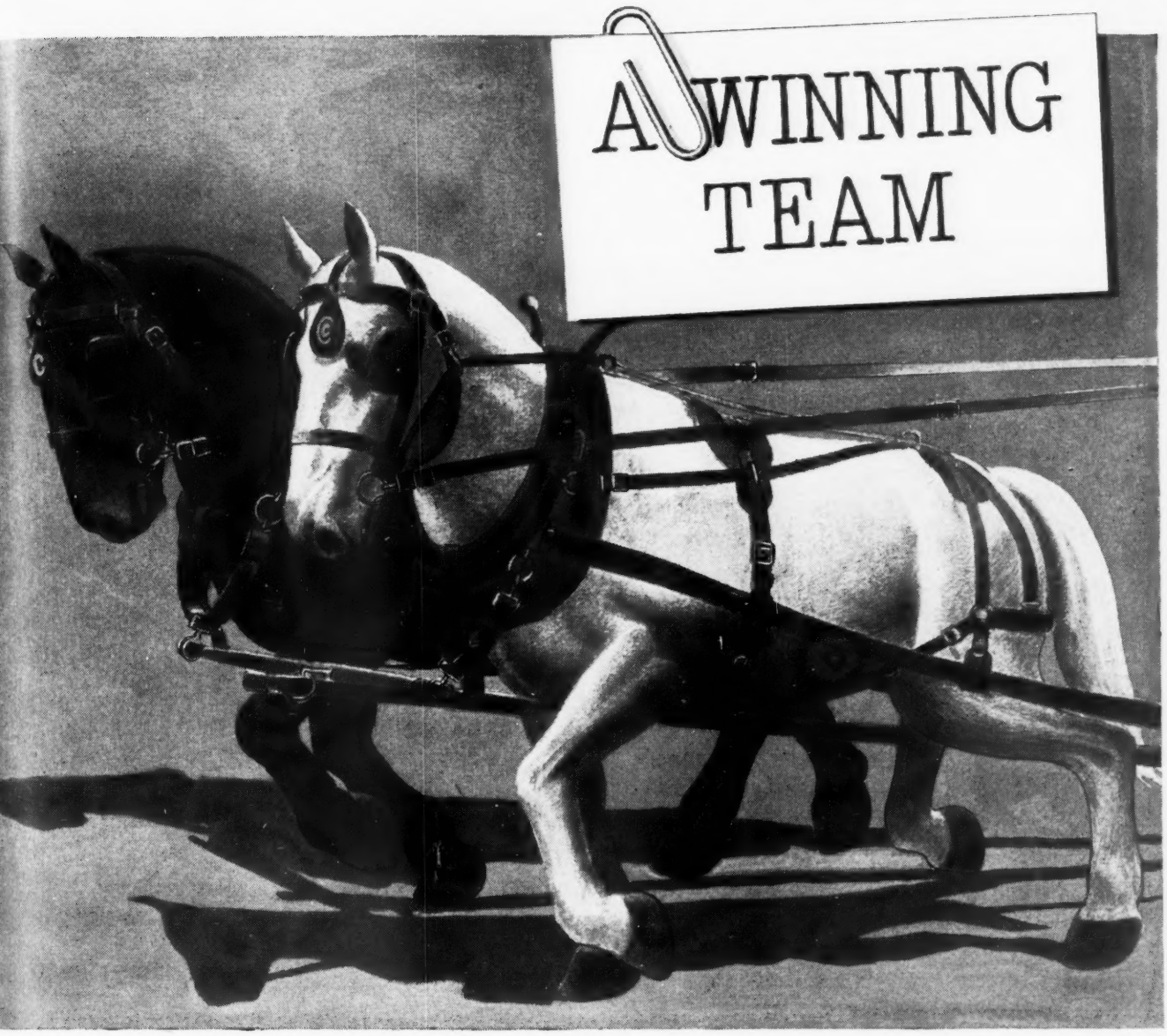
Properties possessed by the combination of the two materials said to be better than when the oil-resistant rubber is used alone are extreme resistance to the effects of sunlight and ozone, increased resistance to benzene and similar aromatic solvents, both in swelling and cracking; low-temperature flexibility combined with excellent heat resistance, improved flexing life, tear resistance, resilience and oven aging.

Products in which these combinations are said to produce unusual advantages are jackets for insulated wire and cable; hose covers, where resistance to sunlight, solvents, oils, chemicals and heat is needed; etc.

•

Industrial Notes

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa., has appointed William W. Sproul Jr. as manager of the application department of its Sharon works. He has been with the company since 1927. Russell E. Ebersole has been named lamp sales manager of the lamp division with headquarters at the Bloomfield plant. Walter Maytham Jr. has been made industrial manager, northwestern district, with headquarters in Chicago. L. A. Selleg, since



BRINGING TEAMWORK TO THE COAL BUSINESS

Coal and calcium chloride make a winning team. Working together they give the householder just what he wants, the best and most economical fuel without the annoyance of dust and dirt. While untreated coal supplies heat at low cost it may also cause extensive housecleaning and redecorating bills. Householders do not, and coal dealers should not need reminding that Coal harnessed to calcium chloride makes a winning team. Right now, when so many suppliers treat buyers with indifference, is the right time to earn customer good will and the reward of postwar business. It pays to be one of those dealers who orders all coal dustproofed at the mine — who will say to his customers, "Yes, I'll send you dustproofed coal." And our Bulletin No. 37 telling how to do it is sent on request.

CALCIUM CHLORIDE ASSOCIATION, 4145 Penobscot Building, Detroit 26, Mich.

DUSTPROOF COAL AT THE MINES WITH

CALCIUM CHLORIDE

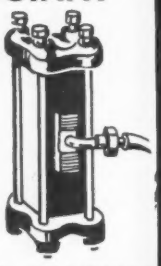
There's a
BRANFORD PNEUMATIC VIBRATOR for EVERY SPOT!

PIGMY
3/8" PISTON DIA.

WHERE CLOGGING OCCURS
IN PIPES, HOPPERS, BINS, CHUTES, etc.

Vibrator Valve
Controls Rate of Flow

GIANT



8" DIAMETER PISTON

Write — State Problems

Send plan of equipment — Specifications — Tonnage handled — Wet or dry materials — Size of materials — Ask for Bulletin "E".

NEW HAVEN VIBRATOR CO.
NEW HAVEN 7, CONN.

PUT A BRANFORD AT THE SPOT WHERE IT'S NEEDED

One-half of air pumped never reaches the face — You can better that percentage at your mine with —

Try the "Blow-Torch Test"

MOROPA

COTTON BRATTICE CLOTH

This is no time to risk production losses through faulty ventilation . . . . MOROPA COTTON BRATTICE CLOTH, as proved in the mines of many leading producers, is the soundest choice for the safety that allows you to boost vital production.

A careful examination of MOROPA'S characteristics reveals the reasons for its acceptance. MOROPA is Flame-Resistant, has low Porosity, Resists Mildew, and gives Maximum Wear.

See data on MOROPA, page 123 of the 1943 Coal Mining Catalog . . . or write us! MOROPA comes in standard widths up to 84 inches.

Moropa

. . . . made in America, of American Cotton, manufactured by . . . .

Act today to eliminate unnecessary ventilation risks . . . . install MOROPA.

JOHN FLOCKER & COMPANY
642 GRANT ST. EST. 1822 PITTSBURGH, PA.

1925 assigned to the Milwaukee office, has been named manager of the petroleum, chemical and mining section, northwestern district, with headquarters in Chicago.

CITIES SERVICE OIL CO. has opened a special sales-service department for coal lubrication at 32 East Carson St., Pittsburgh, Pa., in charge of T. E. Shepherd, division, and H. L. Dunbar, sales manager.

ALLIS-CHALMERS MFG. CO., Milwaukee, Wis., has elected William C. Johnson, James M. White and William A. Roberts as vice presidents. Mr. Johnson, who has been general sales manager, went to Allis-Chalmers in January, 1924. Mr. White went to the company in 1929 after graduating from Alabama Polytechnic Institute. Mr. Roberts went to the company as a salesman after varied experiences as a road contractor and salesman.

RAYBESTOS-MANHATTAN, INC., has elected Harry E. Smith, general manager of the Manhattan Rubber Mfg. division, Passaic, N. J., and Robert B. Davis, general manager of the Raybestos division, Stratford, Conn., as vice presidents. Both are members of the board of directors.

FLOOD CITY BRASS & ELECTRIC CO., Johnstown, Pa., has advanced F. Fraser MacWilliams to general manager, vice Charles N. Replogle, Sr., who died March 22 after a brief illness. Mr. MacWilliams formerly was assistant to Mr. Replogle.

SULLIVAN MACHINERY CO., Michigan City, Ind., has elected J. A. Drain Jr.. as vice president in charge of product engineering, research and development. He formerly was assistant to the president, and prior to joining the Sullivan company was president of the Stefco Steel Co.

BOSTON WOVEN HOSE & RUBBER CO., Boston, Mass., announces that because of ill health A. C. Kingston, vice president and general manager, has been obliged to relinquish a large part of his duties and has been appointed consultant to the president on matters of sales policy. H. F. Maxon, district sales manager of the New York and Pennsylvania districts for the last 17 years, has been appointed general sales manager. W. I. Lewis, for the last twelve years assistant to the general manager, has become assistant general sales manager. W. F. Carroll, resident representative in the Philadelphia district, has been appointed district sales manager, succeeding Mr. Maxon.

LINK-BELT CO. has opened a sales office and warehouse at South 151 Lincoln St., Spokane, Wash., with Homer A. Garland in charge. F. H. Herndon has been appointed manager of the coal stoker division, in full charge of its activities and management, with headquarters in the Caldwell plant, Chicago. K. C. Ellsworth, heretofore eastern stoker division manager at New York City, has been appointed sales manager, stoker division, with headquarters at the Caldwell plant.

PORTABLE LAMP & EQUIPMENT CO., Pittsburgh, Pa., announces the removal of its offices and plant to 420 Boulevard of the Allies; phone Grant—1061. Abner

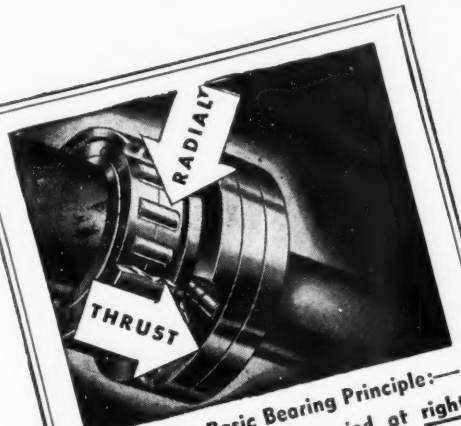
An Important First-Step Toward Postwar
PREVENTIVE MAINTENANCE . . .

Simplify ALL Bearing Loads with

ROLLWAY
RIGHT-ANGLED LOADING

Type MCS
Double Width

PREVENTIVE MAINTENANCE rather than costly repair or replacement will be the rule after the war. In more and more plants . . . on more and more drafting boards . . . ROLLWAY Solid Cylindrical ROLLER BEARINGS will get the nod. That's because Rollway Bearings are always loaded the right-angle way, reducing every load to the magnitude and direction of a single component—either pure radial or pure thrust.



Follow This Basic Bearing Principle:—
● All radial loads carried at right angles to the roller axis.
● All thrust loads carried at right angles to the roller axis.
● All compound loads carried on separate radial and thrust bearings—used in combination—as shown in the diagram.

LOOK at these FACTS!

When load magnitudes go down, higher bearing load capacity, faster operating speed or longer life-expectancy results. Proportionate combinations of all three advantages are possible. The big point is that load pressures per bearing are reduced, lubrication films are maintained and elastic limits of metals are never exceeded due to piling up of compound loads. With the load always carried at right angles to the roller axis, there is no tendency for rollers to wedge or pinch out, hence rubbing friction and roller-end wear-back are reduced. Machine stoppages for bearing replacements or service are less frequent. Manufacturing costs are lower.

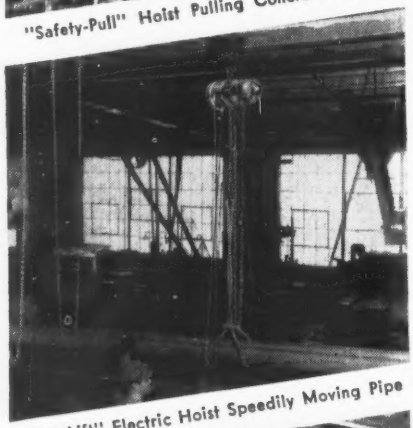
● A wide range of Rollway types in SAE and American Standard Metric Sizes are available for most requirements, eliminating the cost and delay of special tools, patterns and set-ups. Ask for a free Rollway bearing analysis and recommendation. Just send drawings or detailed description. No obligation.

ROLLWAY BEARING COMPANY, INC., SYRACUSE, NEW YORK

BUILDING HEAVY-DUTY BEARINGS SINCE 1908 — BEARINGS

COFFING HOISTS

"Safety-Pull" Hoist Pulling Concrete Forms



"Quik-Lift" Electric Hoist Speedily Moving Pipe

Model "YC" Spur Geared Hoist Moving Large Truck Motor

Write Today for Catalog GG-6

FOR SPEED
SAFETY
ECONOMY
DURABILITY

IN PRACTICALLY ALL LINES OF INDUSTRY COFFING HOISTS ARE PLAYING A PROMINENT PART IN SPEEDING UP
CONSTRUCTION
PRODUCTION
MAINTENANCE

COFFING HOIST COMPANY
Danville, Illinois, U. S. A.

Bushnell has been appointed service engineer. Upon completing a course in electrical engineering he was associated with the R. C. Tway Coal Co., Williamson, W. Va., and more recently with the Kentucky Mine Supply Co. His headquarters will be in Harlan, Ky. Paul J. Ambrose has been appointed electrical and radar engineer.

Reo Motors, Inc., Lansing, Mich. has appointed John W. Mathews as district representative in Indiana and adjacent states.

Wickwire Spencer Steel Co., New York City, has elected R. T. Dunlap and E. F. Early as vice presidents. Mr. Dunlap previously was assistant to the president and for the last several months has acted as general superintendent at the company's Buffalo plant. Mr. Early, long associated with the company, is general superintendent at the company's Morgan plant in Worcester, Mass. They will continue their present duties and responsibilities.

James F. Reid, former deputy chief of the Alloy Steel Branch, War Production Board, has been appointed production manager of the Timken Roller Bearing Co., Canton, Ohio. He had been production manager of the steel and tube division of Timken before obtaining a leave of absence in May, 1942, to join WPB.

American Car & Foundry Co., New York City, announces that Charles J. Hardy is relinquishing part of his duties as president and has been made chairman of the board. John E. Rovensky has been elected chairman of the executive committee. Frederick A. Stevenson, senior vice president and in charge of the company's operations, succeeds Mr. Hardy as president. Howard C. Wick, secretary since 1916, has been appointed executive assistant to the executive committee, which office is combined with that of secretary of the company. L. A. Berard, formerly with the Mt. Vernon Car Mfg. Co., has been appointed sales agent with headquarters at the St. Louis office. H. H. Pancake, formerly engineer, mine-car construction, recently located at Huntington, has been assigned to the Pittsburgh district sales office as sales engineer. J. F. Miller, sales agent at Pittsburgh, has been transferred to the Berwick plant, where he will work on sales matters under direction of the plant management. T. F. Wilson, formerly assistant to the senior vice president, has been named assistant to the president. J. A. V. Scheckenbach, recently elected vice president, has been placed in charge of manufacturing and will have charge of improvements and maintenance in all A. C. F. plants. L. J. Philp, formerly assistant to the president, has been appointed assistant to the chairman.

F. B. Allen, president, Allen-Sherman-Hoff, Philadelphia, Pa., has been awarded a gold medal by the Franklin Institute for developing the sealing-in feature of the hydroseal pump.

E. I. DuPont de Nemours & Co., Inc., Wilmington, Del., has appointed Harold Brayman to be directo. of its public relations department, vice Theodore C. Joslin, who died suddenly April 12.

NO MORE TRAMP IRON

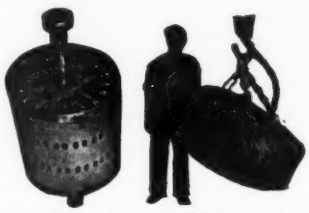
with a

Stearns MAGNETIC

AUTOMATIC SPOUT TYPE SEPARATOR

If you have a "dirty coal" problem as the result of tramp iron and junk, it will pay you to investigate the STEARNS spout magnet shown above.

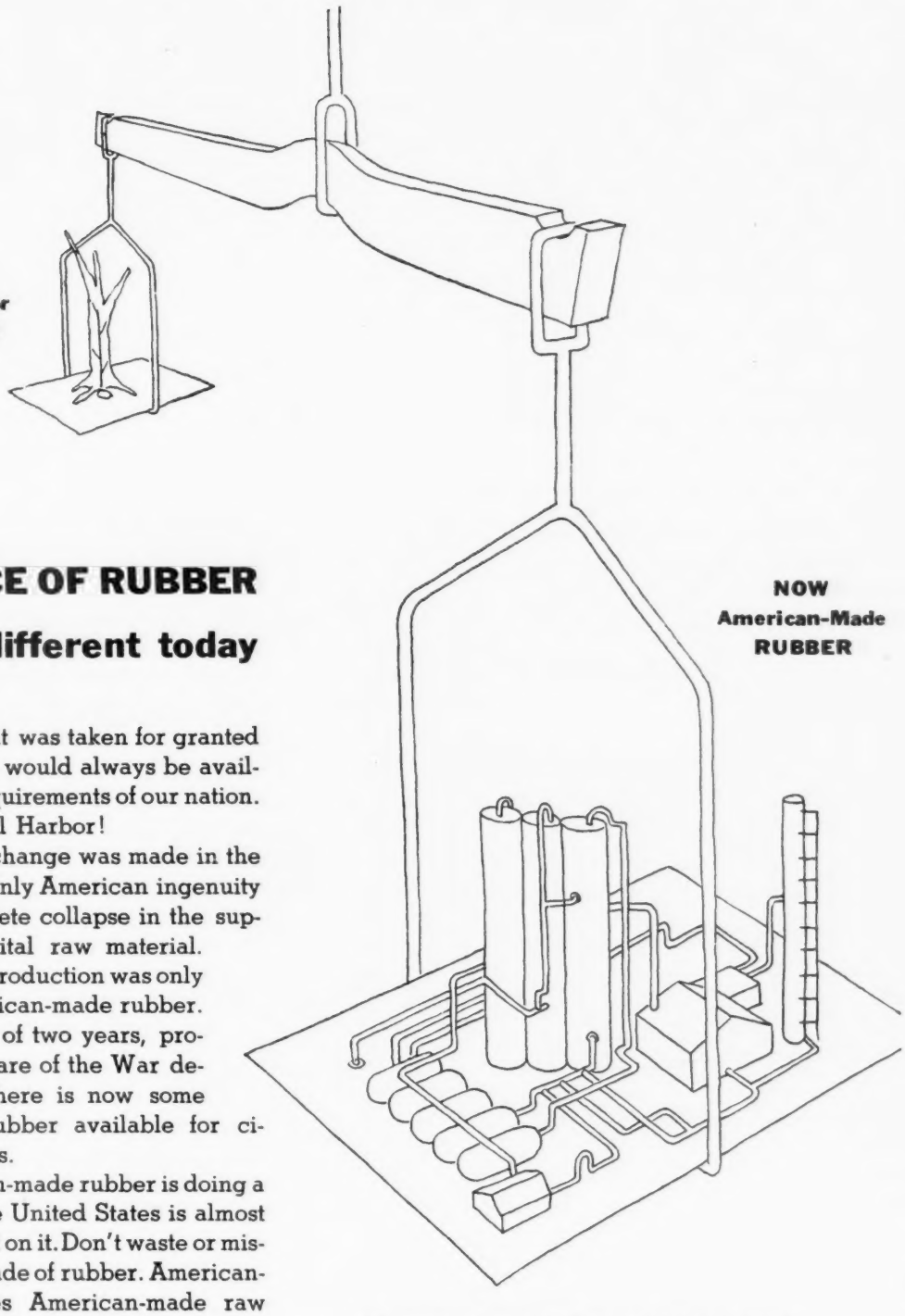
Built for rugged service, gives positive, automatic protection. In all sizes. Write for our Bulletin 97-A.



Also widely used are STEARNS improved air-cooled powerful Magnetic Pulleys (our Bulletin 302) and Suspended Magnets (Bulletin 25). Tell us about your capacities, plant layouts, etc.

STEARNS MAGNETIC MANUFACTURING CO.
661 S. 28th St., Milwaukee, Wis.

STEARNS-MAGNETIC MILWAUKEE



THE SOURCE OF RUBBER

. . . different today

For many years it was taken for granted that Crude Rubber would always be available to meet the requirements of our nation.

Then came Pearl Harbor!

Instantly a vast change was made in the source of supply. Only American ingenuity prevented a complete collapse in the supply of this most vital raw material.

At the start, the production was only a few tons of American-made rubber. In the short space of two years, production is taking care of the War demands. Besides, there is now some American-made rubber available for civilian requirements.

Today, American-made rubber is doing a wonderful job. The United States is almost entirely dependent on it. Don't waste or misuse any product made of rubber. American-made rubber uses American-made raw materials and American Labor and keeps the money in circulation in America.

Quaker for many years has been most active in experimenting and working with American-made (Synthetic) rubber. In many instances, it has already proven better for certain kinds of work than Crude.

When you need Industrial Rubber Products, consult Quaker. Even during these trying days, Quaker has been able to supply Industry with a considerable quantity of Rubber Products, in addition to the large volume of products which we are constantly supplying the Government.

If there is a way to get it done—Quaker will do it!

QUAKER RUBBER CORPORATION

PHILADELPHIA 24, PA. • NEW YORK 7 • CLEVELAND 15 • CHICAGO 16 • HOUSTON 1

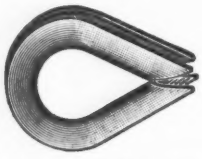
Western Territory

QUAKER PACIFIC RUBBER COMPANY • SAN FRANCISCO 5 • LOS ANGELES 21

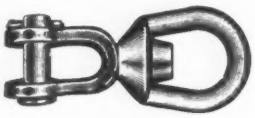
A prominent aviation manufacturer used a Laughlin Safety Hook, as shown, as part of a riveting machine set-up purposely devised for the safety and efficiency of women war workers.

This hook's unique, stout-springed safety latch holds its burden securely despite strain or jolts. That's why workers like it — it's safer.

This latch is available on all sizes and styles of Laughlin hoist hooks.



LAUGHLIN THIMBLES: Two styles . . . regular and plow steel pattern (extra heavy for use with plow steel and high tensile wire ropes).



LAUGHLIN SWIVELS: Made in the following types: jaw and jaw, chain swivel, swivel with jaw end, swivel with swivel. Drop-forged.

Write for catalog showing the complete line of Laughlin Wire Rope Fittings

Distributed through Mill, Mine and Oil Field Supply Houses

Look for Laughlin Products in COAL MINING CATALOGS

FORGING A SHARE IN VICTORY

THE THOMAS LAUGHLIN Company
PORTLAND 6, MAINE

COPPERWELD STEEL Co., Warren, Ohio, has appointed N. H. Brodell, formerly metallurgical sales manager, as Cleveland district manager.

GOODYEAR TIRE & RUBBER Co. has started production of synthetic rubber hose and other products at its Los Angeles plant, under direction of J. E. Mayl, vice president.

ATLAS POWDER Co. will move the Philadelphia district sales offices of its explosives department to the Empire Building, New York City, May 22. Explosives sales offices now at 60 East 42d St., New York, will be moved to the same address. A sales office will be maintained at the old address in Philadelphia. W. C. Manning, assistant director of sales, explosives department, will be transferred from the general offices at Wilmington, Del., to take charge of the new offices, vice E. W. Moorehouse, who will retire July 1 after 44 years in the explosives industry.

WESTINGHOUSE ELECTRIC & MFG. Co., East Pittsburgh, Pa., has apointed Russell L. Whitney as manager, agency and specialties division, central district. Formerly sales manager of the company's transformer division at Sharon, Pa., he succeeds H. E. Bracke, who has been named to a new post with the Westinghouse Electric Supply Co. in Detroit. Mr. Whitney will be stationed in Pittsburgh.

MACMILLAN PETROLEUM CORP., Los Angeles, Calif., has appointed Howard W. Cheney, for the last year advertising and sales promotion manager of the Lockheed Aircraft Corp., Burbank, Calif., to a similar position.

•

Trade Literature

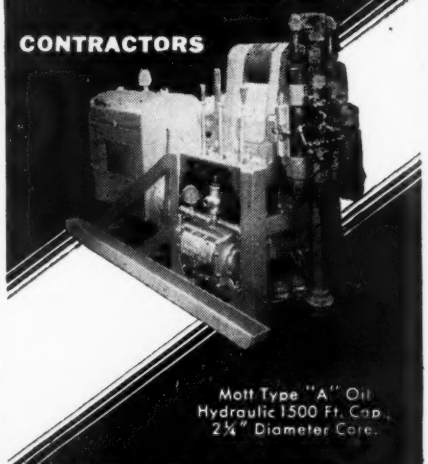
PIPE FITTINGS AND COUPLINGS—Victaulic Co. of America, New York City. Catalog and Engineering Manual 44 is designed to provide a working tool to help solve piping problems. It also illustrates interesting examples of how Victaulic couplings and full-flow fittings are serving modern industry.

WIRE ROPE SLINGS—John A. Roebling's Sons Co., Trenton, N. J. Catalog shows various types of slings made by the company, gives data on wire rope and grommet slings for both standard and special uses, and also the new "Flatweave" sling. In addition to recommended safe loads and size ranges the book is profusely illustrated with application pictures of slings in actual service. A section is devoted to various types of wire-rope fittings used in connection with slings.

WIRE AND CABLE GUIDES—Hazard Insulated Wire Works Division, Okonite Co., Wilkes-Barre, Pa. Wall chart tells what to do to better wire and cable performance before ordering, when ordering, when storing, when installing, when using and when needing advice.

CARS—Pressed Steel Car Co., Pittsburgh, Pa. Catalog 72-I, 72-G and 72-D describe the company's line of cradle and rocker cars, self-discharge cars and square

MOTT
DIAMOND CORE DRILLING
CONTRACTORS



Mott Type "A" Oil Hydraulic 1500 Ft. Cap., 2¼" Diameter Core.

● Coal and all mineral properties tested—using our light gasoline drills. They save fuel and moving costs . . . guarantee satisfactory and proper cores.

Pre-pressure grouting for mine shafts . . . ground solidification for wet mine areas by our stop grout method. Water wells and discharge holes drilled and grouted . . . electric drills for inside mine drilling.

MOTT CORE DRILLING CO.
HUNTINGTON • WEST VIRGINIA

HERCULES AUGERS

Hercules Augers

Ideal for modern high speed electric drills—withstands whips and torsional strains. Flint hard and tough as whalebone. Drills faster—drills more holes with resharpening—outlasts four to five ordinary drills. Recommended for the hardest jobs. Up to 3" diameters—up to 16 ft. in length.

Black Diamond Augers

Carefully made from high-carbon crucible grade steel—heat-treated to obtain as much hardness and toughness as possible, to prevent broken tangs and points. Furnished up to 2" diameters—maximum over-all lengths 16 ft.

Standard Augers

Originally developed for use with hand drills. These augers work best at hand drilling drilling holes under stumps, and ditch blasting. Up to 2" diameters from oval steel, 7/16" thick, and maximum length of ten ft.

Call on us for any type auger you may require in your operations. We specialize in manufacturing the better grade alloy, heat-treated augers. Write, wire or 'phone for details concerning sizes, prices, deliveries, etc.

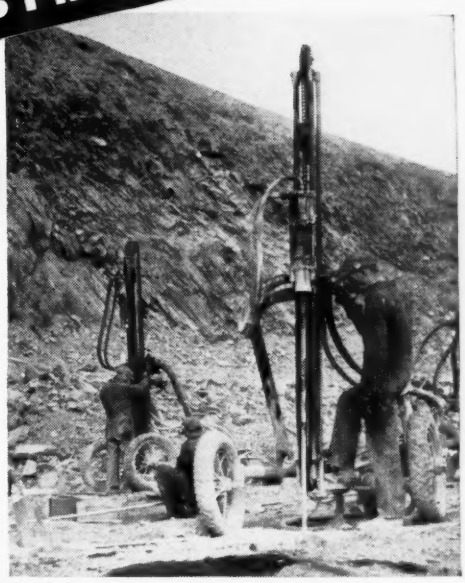
SALEM TOOL COMPANY
SALEM OHIO

HERE'S PERFORMANCE *THAT CLIPS TONNAGE COSTS*

WHEREVER there's coal to be mined—the *better performance* of Gardner-Denver equipment helps clip tonnage costs. For Gardner-Denver rock drills and portable compressors have special features that cut out waste of time and delay . . . that help you "get at" the coal more quickly and more easily.

. . IN STRIP MINING

Gardner-Denver Portable Compressors, available in a complete line, are built to *stay* on the job. They are *all* water cooled compressors for all weather performance . . . famous for their ability to deliver an abundant, unfailing air supply.



For drilling deep holes in tough overburden, use Gardner-Denver Wagon Drills. All models of Gardner-Denver Wagon Drills are fitted with constant blowing air tubes and a powerful auxiliary blowing device for cleaning the hole between steel changes with full line pressure air.

The Gardner-Denver S-33 is an easy-to-handle, 31-pound drill that does a fast job in hard rock, shale or coal. Its conveniently located blow valve keeps the hole clean.

. . FOR HAULAGE WAYS

Famous for their performance and on major tunnel jobs throughout the country, Gardner-Denver Continuous Feed Drifters assure faster progress in your haulage ways. Because these rock drills are built to minimize vibration, drilling speed and efficiency are increased . . . over-all maintenance kept below that of the hand-cranked drill.

For complete information, write
Gardner-Denver Company, Quincy, Illinois.

MAKES AIR *Cost Less* AND *Do More*

Since 1859

GARDNER-DENVER

box dump and quarry cars, developed especially for mines, quarries and contractors as well as industrial plants. No. 72-C covers rolling trunnion automatic air dump cars featuring easy, positive, fast dumping action under all conditions, according to the manufacturer. No. 72-H is devoted to all types of mine cars, for dumping in any direction.

COMPRESSORS—Sullivan Machinery Co., Michigan City, Ind. Bulletin A-52 describes line of heavy-duty two-stage air-cooled compressors for industrial plants, mines and heavy contracting. Illustrated brochure shows many installations; gives full description of available sizes, types and drives and construction details; also information as to foundation requirements, regulation, accessories and servicing.

V-BELTS—Goodyear Tire & Rubber Co., Akron, Ohio. "Goodyear Engineering Data for V-Belts" is the title of a pamphlet reprinted from Goodyear's "Handbook of Belting," containing complete details on care and installation of all types of V-belt drives.

WIRE ROPE—Macwhyte Co., Kenosha, Wis. Catalog G-15 contains revised strength, weights and grades of wire rope plus new, easily found, practical wire-rope information.

HYDRO-SEPARATOR—Roberts & Schaefer Co., 307 North Michigan Ave., Chicago 1, Ill. Bulletin 161 describes the tandem hydro-separator with troughs and cells, said to combine the advantages of launder presetting and continuous upward current in the cells—i.e., the flow from the launder deposits the slate onto the perforated cell deck where it joins the slowly moving slate bed to the discharge; while the lighter coal from the trough meets the upward current and floats to the discharge.

CAR PULLERS—Jeffrey Mfg. Co., Columbus 16, Ohio. Bulletin 774 tells of the advantages of Jeffrey "All-Purpose" car pullers wherever railroad cars must be spotted for loading or unloading. Specifications are given.

LUBRICANTS—Sinclair Refining Co., Inc., New York 20, N. Y. Bulletin gives non-technical treatment of most of the generally used lubricating greases, with illustrations and recommendations.

AIR COMPRESSORS—Worthington Pump & Machinery Corp., Harrison, N. J. Bulletin H-620-B21C describes tank-mounted feather-valve air compressors, giving specifications for three models.

COAL HAULERS—Euclid Road Machinery Co., Cleveland, Ohio. Bulletin Form 210 delineates outstanding features of the Model F Euclid 20-ton bottom-dump coal hauler, giving specifications.

BATTERY CHARGING—Electric Storage Battery Co., Philadelphia 32, Pa. Bulletin 207, on charging equipment for Exide batteries in motive power service, contains a complete detailed description of the two-rate and the modified constant potential systems of charging, with numerous diagrams, graphs and tables.

CALCIUM CHLORIDE — Wyandotte Chemicals Corp., Wyandotte, Mich. Thirteen folders describe and illustrate the many uses of calcium chloride in business, industry and institutions.

SAFETY GOGGLES—W. S. Wilson Corp., 123 Varick St., New York 13, N. Y. Bulletin presents ten outstanding advantages of the Willson "Monogoggle" for protection on the job.

MINE-CAR DUMPING AND CONTROL DEVICES—Mining Safety Device Co., Bowerston, Ohio. Catalog details features of Nolan cages, cagers, car hauls, car stops, cage landing chairs, car dumpers, dump feeders, retarders, safety horns, safety shaft gates, switches, trip feeders and trip makers.

POWER CENTERS—Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Booklet B-3224 contains a time-saving guide to the selection and specification of outdoor and indoor transformer installations, including coordinated disconnect and protective equipment. Standard arrangements are suggested to fit the various types of distribution systems.

WE'VE STARTED OUR POST-WAR PLANNING BY SERVING OUR GUESTS WELL NOW!
hotel Mayfair
IN ST. LOUIS
THE START OF ANY POST-WAR PLANNING
BUY WAR BONDS NOW!

PROFESSIONAL SERVICES

Consulting Engineering Examinations — Specialists Geologists Reports — Plant Design Operation Construction

ALLEN & GARCIA CO.
ENGINEERS AND BUILDERS OF MODERN COAL OPERATION
Authoritative Valuations and Reports of Mining Properties, Equipment and Operation.
332 S. Michigan Ave., Chicago
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COAL PREPARATION
To Yield Maximum Net Returns
Face and Product Studies
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Reports, Valuation, Construction, Operation, Management
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Mining Engineers
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MINE MECHANIZATION
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Oliver Building—Pittsburgh, Pa.

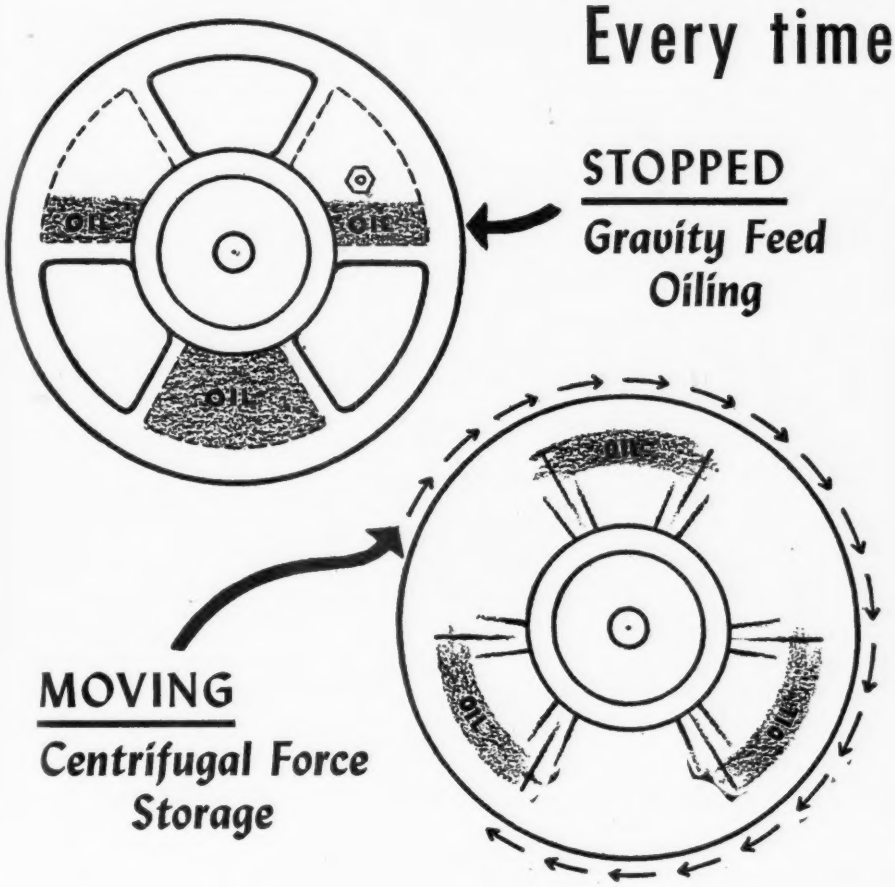
J. H. FLETCHER
30 Years
Continuous Consulting Service to Coal Mines
Telephone Harrison 5151
McCormick Building Chicago, Illinois

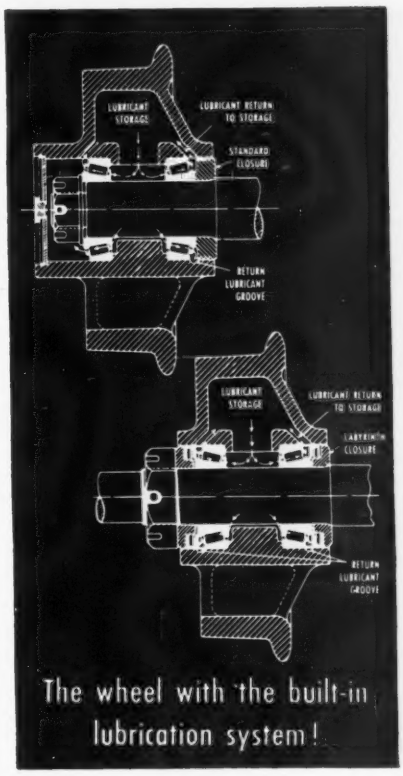
READERS MAY CONTACT THE CONSULTANTS
whose cards appear on this page with the confidence justified by the offering of these special services nationally.

The secret of long service

Automatic Lubrication

Every time it starts!





When "Oilspok" Wheels start turning, they start lubricating . . . every time . . . automatically. No greasing attention needed. One oiling lasts 5000 to 6000 miles.

Each spoke of "Oilspok" Wheels has three ports leading into the hub—one large central port and two narrow rectangular ports, situated at the outside of each bearing. The lubricant passes readily through the large central port to the bearings and is then thrown back through the rectangular ports by centrifugal force to the storage reservoirs.

Thus, the lubricant in "Oilspok" Wheels is free-flowing. No chance to gum up or cause excessive tread wear by churning resistance like that of heavy, adhesive greases.

That is why "Oilspok" Wheels have longer life at lower maintenance cost. Get the best in mine wheel cars. Use "Oilspok" Wheels. Write for full information.—HOCKENSMITH WHEEL & MINE CAR COMPANY, *Established 1877. Penn, Pa. Phone—Jeannette 700.*

"OILSPOK" WHEELS WILL—

1. *Increase Wheel Life.* Excessive tread wear—caused by the churning resistance of heavy greases—is eliminated. Free wheel rotation.

2. *Save Power.* Free wheel rotation means no power lost by churning grease. The lubricant in the "Oilspok" wheel is fluid and free flowing.

3. *Save Lubricant and Lubricating Labor.* "Oilspok" lubrication is positive and continuous—no loss due to bearing pumping pressure or air expansion. One greasing lasts several years—less labor cost and loss of car service.

4. *Give Longer Bearing Life.* Bearing lubricant is constantly changed—bearings clean and cool—constant circulation maintains lubricant in better condition.

5. *Increase Axle Box Life.* "Oilspok" wheels are free turning under all temperature conditions—no chance of axles turning in dry boxes.

6. *Eliminate Disadvantage of Small Diameter Wheels.* Higher hub resistance—a characteristic of small diameter wheels with large bearings—is substantially reduced in "Oilspok" wheels with their positive, circulating fluid lubrication.

7. *Provide Stronger Wheel—No Extra Weight.* "Oilspok" wheels have tapered box-section spokes—the strongest possible construction for resisting side thrust and vertical loads. Same weight as standard wheels for various bearing and axle sizes.

Hockensmith *"Oilspok"* Wheels

THE COST OF LEAKS
SIZE OF OPENING
AIR
100 LBS. PRESSURE
Cu. FT. WASTED PER MONTH
COST AT 10c PER M
STEAM
100 LBS. PRESSURE
LBS. WASTED PER MONTH
COST AT 6m PER M
WATER
40 LBS. PRESSURE
GAL WASTED PER MONTH
COST AT 15½c PER M
3/8 9,979,200 $997.92 460,000 $276.00 692,400 $108.00
1/4 4,449,600 444.96 203,000 121.80 307,700 48.00
1/8 1,114,560 111.46 50,500 30.30 76,900 12.00
1/16 278,640 27.86 12,750 7.65 19,200
1/32 69,552 6.96 3,175 1.91 4,800
TIGHT VALVES STOP LEAKS—SAVE MONEY
USE DEXTER VALVE RESEATING MACHINES

You can see a lot through a PINHOLE

COAL MINE Executives, for example, can see the loss of thousands of pounds of steam, air or water in a valve leak no bigger than the average pinhole.

In terms of pounds and money, a little $\frac{1}{32}$ inch valve leak can pile up real losses, as shown on the card. Here are the figures taken from long-term tests, based on normal pressures.

Larger leaks produce losses in far greater proportion than on a basis of comparative size. For instance, a $\frac{3}{8}$ inch leak brings a loss of 460,000 lbs. of steam, normally costing $276.00 a month!

Reseat the Valve the Easy Dexter Way

Losses in steam, air, water — and DOLLARS, by leakage, are only the *first costs*. Shutdowns, replacements and high labor costs follow . . . *unless* you are equipped with a Dexter Valve Reseating Outfit.

With Dexter equipment, your leaky valves can be reseated, in a few minutes, *right on the line*. One man can do the job, and your valves will be as tight as new.

Write us about your valve leaks. We'll give you complete information about the proper Dexter Reseating Machines and Cutters to take care of your valves — from now on.

8

THE LEAVITT MACHINE COMPANY
ORANGE, MASSACHUSETTS

Simplex Spells Safety When It Comes to Mine Jacks

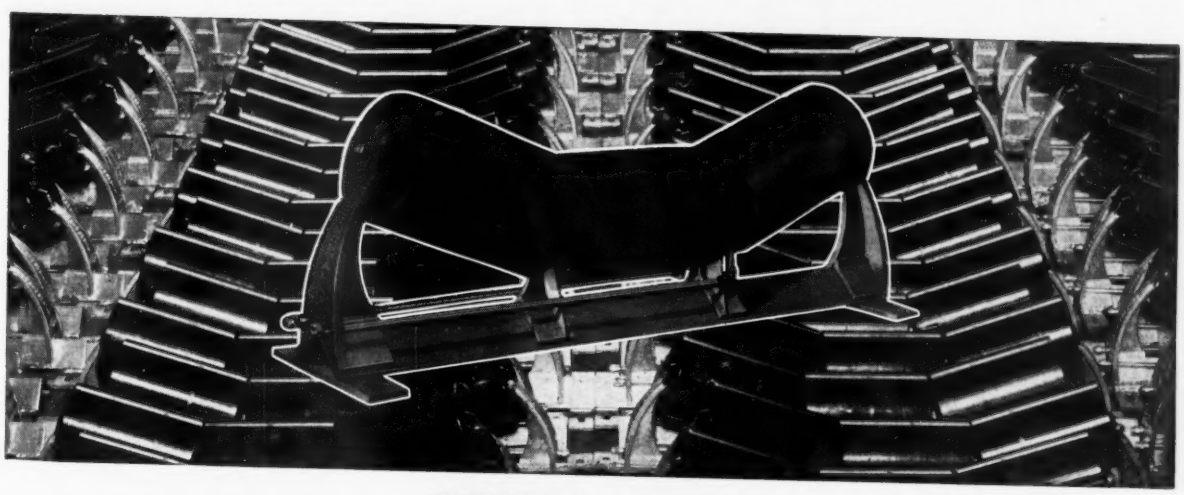
A size for seams of any thickness:
84A, 14" high, 7" lift
85A, 17" high, 10" lift
86A, 20" high, 13" lift.
Toe lift on all sizes lifts from a minimum of 1¾". 5-tons capacity.

Since 1899 Simplex Jacks have proved highly effective ordnance in the ceaseless war against mine accidents. Every construction detail of Simplex Automatic Lowering Mine Jacks is a true safety feature; including alloy steel drop forged heat-treated parts, precision machining, unbreakable trunnions and unbendable foundation. It pays to have a Simplex Jack handy on every coal cutter, loader and locomotive.

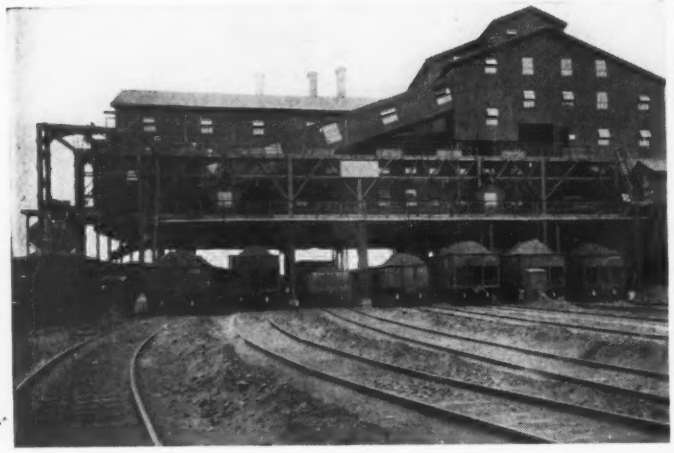
Templeton, Kenly & Co., Chicago (44), Ill.
California, Pa. Princeton, W. Va.
Better, Safer Mine Jacks Since 1899

Simplex
LEVER · SCREW · HYDRAULIC
Jacks

Continental BELT CONVEYORS *Will Cut Your Haulage Costs*



INDUSTRIAL DIVISION
CONTINENTAL GIN COMPANY
BIRMINGHAM, ALABAMA
CGC ATLANTA • DALLAS • MEMPHIS CGC



CLEANER COAL
because of MORRIS Pumps

In coal mines all over the country, MORRIS Centrifugal Pumps are being used as the standard on coal cleaning processes because of their long-wearing qualities, trouble-free operation, and high efficiency.

In other coal-mine pumping services, too, MORRIS Pumps have established records for durability and economy . . . even where corrosive mine water or highly abrasive materials are to be handled.

FOR 80 years, MORRIS has specialized on the "hard-to-handle" services. This unequalled experience assures authoritative recommendations, and the large MORRIS line of material-handling pumps provides exactly the right type for every requirement.

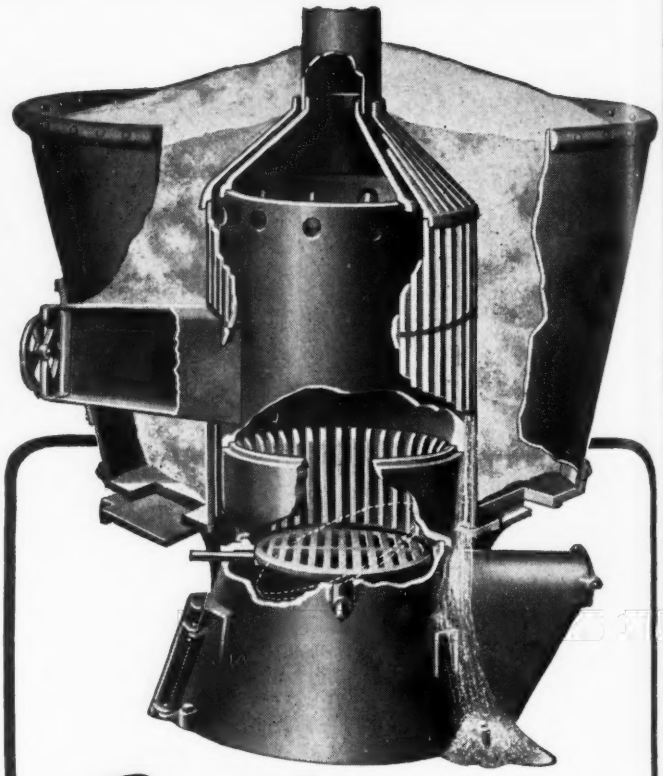
Morris Heavy Duty Material-Handlinng Pump

MORRIS MACHINE WORKS
Baldwinsville, N.Y.

MORRIS
ESTABLISHED 1864

Export Office:
50 Church St.
New York 7, N. Y.

CENTRIFUGAL PUMPS



Viloco
AUTOMATIC SAND DRYER

Reduces Fuel Costs for Drying Sand

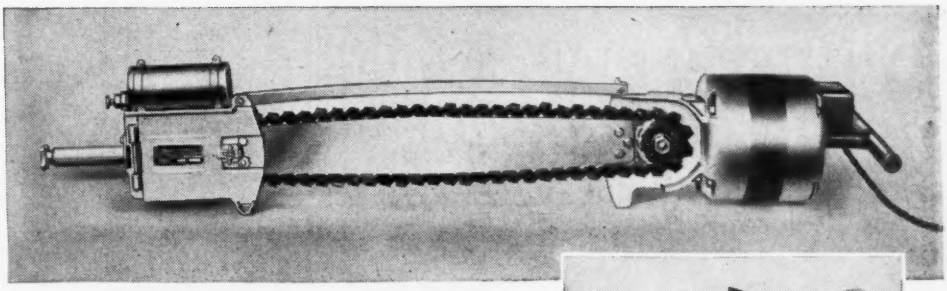
The operation of the Viloco Sand Dryer is automatic—sand flows freely through the grating as it dries. The grating is so constructed that it prevents wet sand coming in contact with the stove. Plenty of cleaning slides are provided around the hopper base for ready removal of any material that cannot pass through the grating. The fire grate can be removed through the ash door. Parts of stove subjected to fire are made of Chrome Nickel Heat Resisting Iron.

The Viloco Sand Dryers are made in two sizes. The hopper capacity of the No. 1 featured above is 3 cubic yards and a smaller size, No. 2, with 1 cubic yard capacity.

The hopper should empty itself about once every two hours under ordinary conditions.

VILOCO RAILWAY EQUIPMENT CO.
332 SOUTH MICHIGAN AVENUE · CHICAGO

New
time and labor saving POWER Saw
(Electric or Air)
with these 7 advantages



Chain Links Replaced in 2 Minutes without tools by hooking or unhooking patented permanently welded hooks.

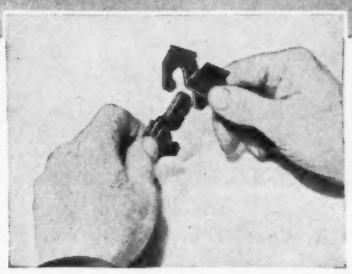
Fast Cutting Action results from narrower kerf and a series of 4 teeth specially arranged to make complete cutting cycle.

Minimum Power Consumption because of narrower kerf and chain. Yet chain has unusual strength. Tests show safety factor of 20 to 1

Longer Chain Life. Unique welded construction permits use of larger hinge pin at front end of each link. Larger pin and extra length teeth nearly double chain life.

Easy to Sharpen. Thin cutting edge with cutting surface arranged to minimize effort required to file or grind edges.

Less Wear on Sprocket and Chain. Power applied at pitch line by scientifically designed central drive prevents



chain from climbing out sprocket and reduces chain tension and wear.

No Chain Clogging or Binding result of new sprocket construction. Open structure between teeth permits pitchy sawdust to pass through.

3 H. P. Electric Model or 4½ H. P. Air Model now available with 24" or 36" chain. Prompt delivery assured on proper priority. For engineering information and descriptive data, write or wire —

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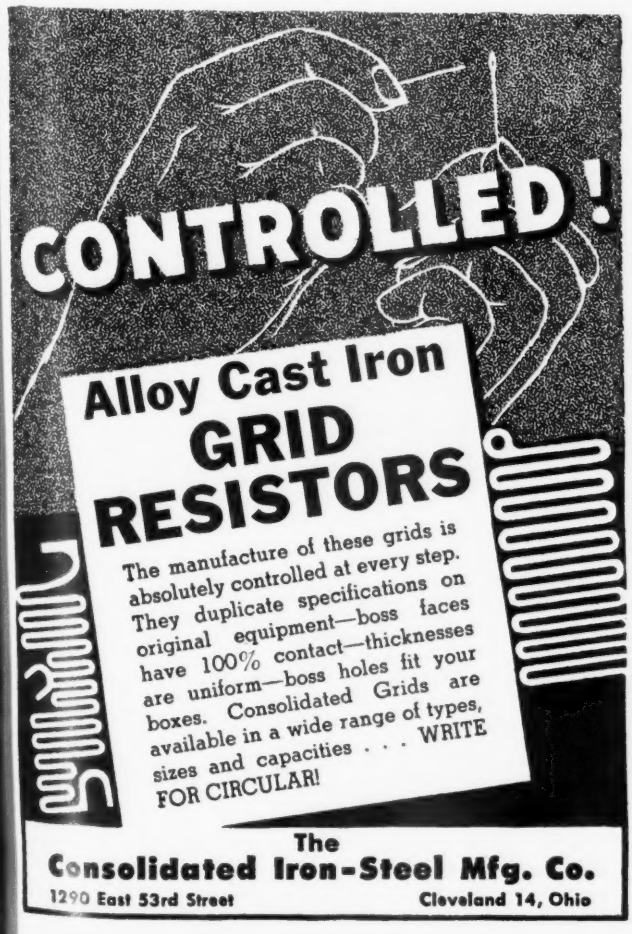
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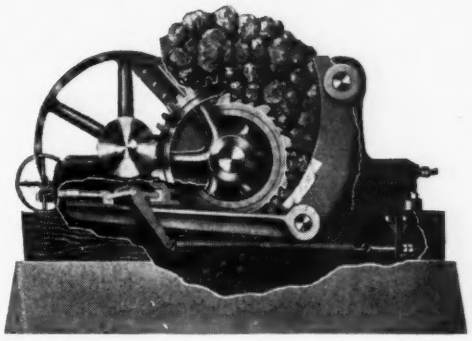
McLanahan Black Diamond Crusher



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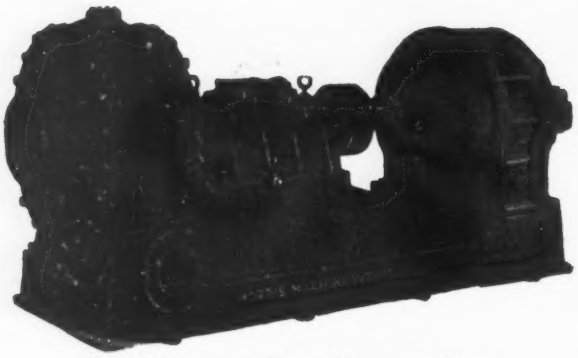

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Export Office:
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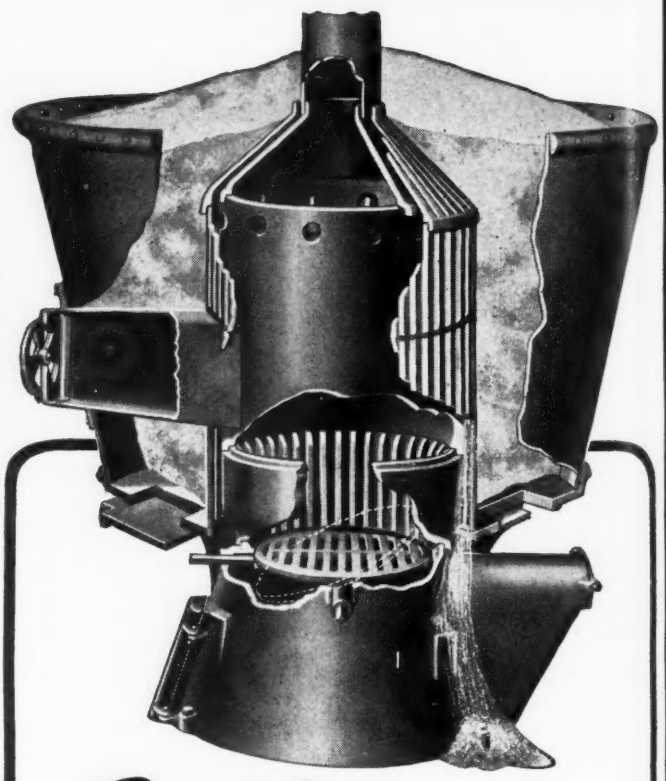

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Reduces Fuel Costs for Drying Sand

The operation of the Viloco Sand Dryer is automatic—sand flows freely through the grating as it dries. The grating is so constructed that it prevents wet sand coming in contact with the stove. Plenty of cleaning slides are provided around the hopper base for ready removal of any material that cannot pass through the grating. The fire grate can be removed through the ash door. Parts of stove subjected to fire are made of Chrome Nickel Heat Resisting Iron.

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The hopper should empty itself about once every two hours under ordinary conditions.

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(Electric or Air)

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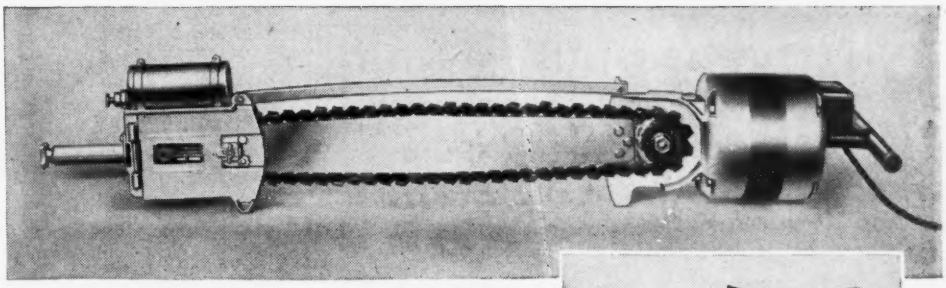

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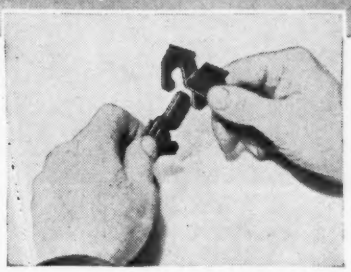

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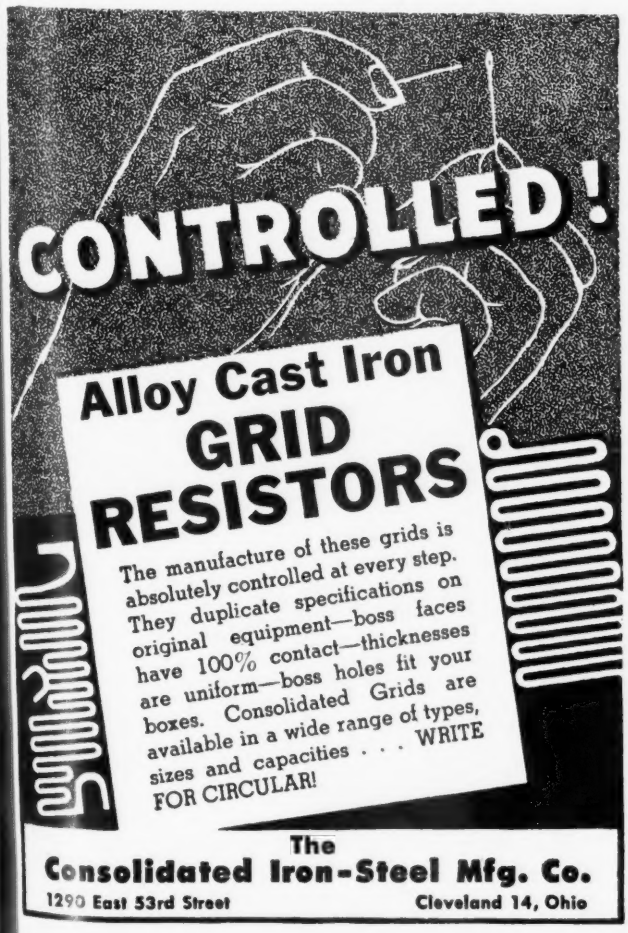
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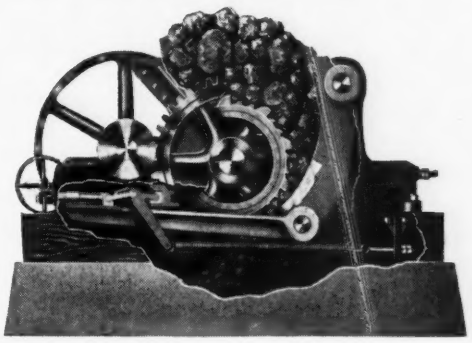

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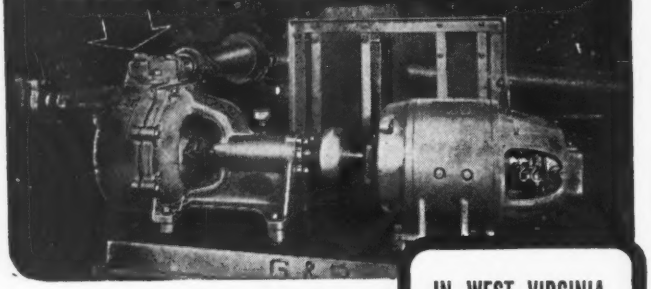

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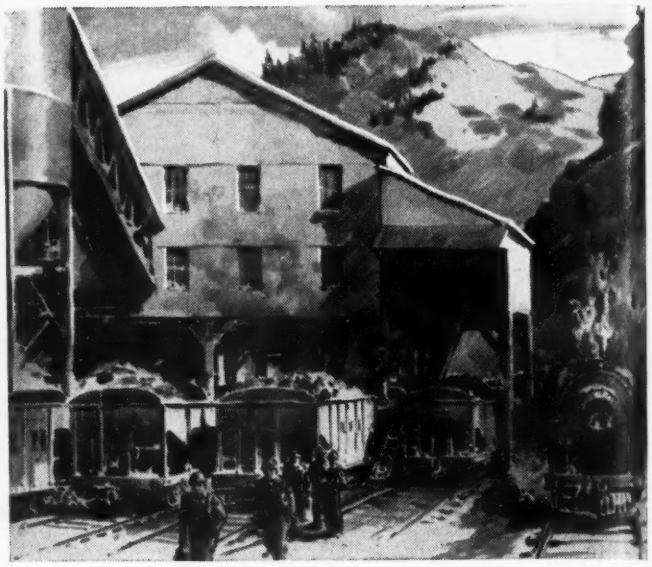

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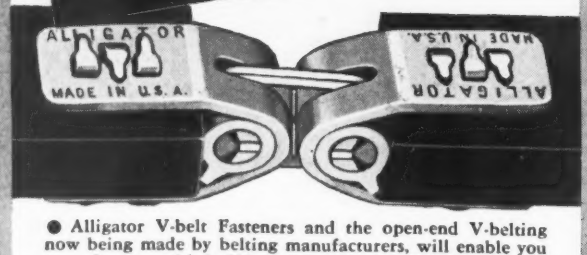

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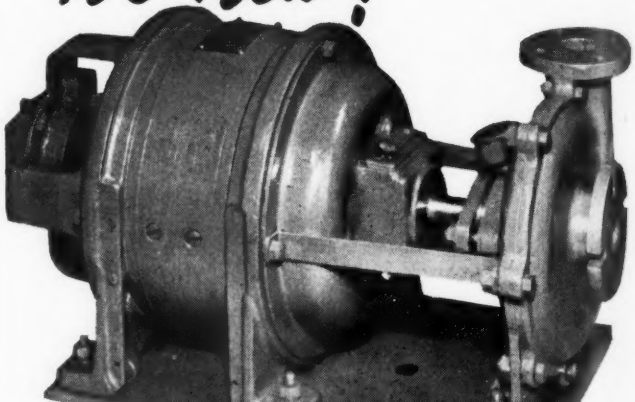

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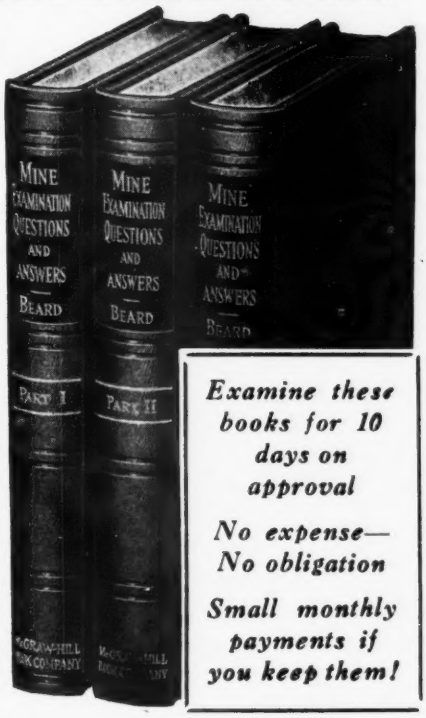

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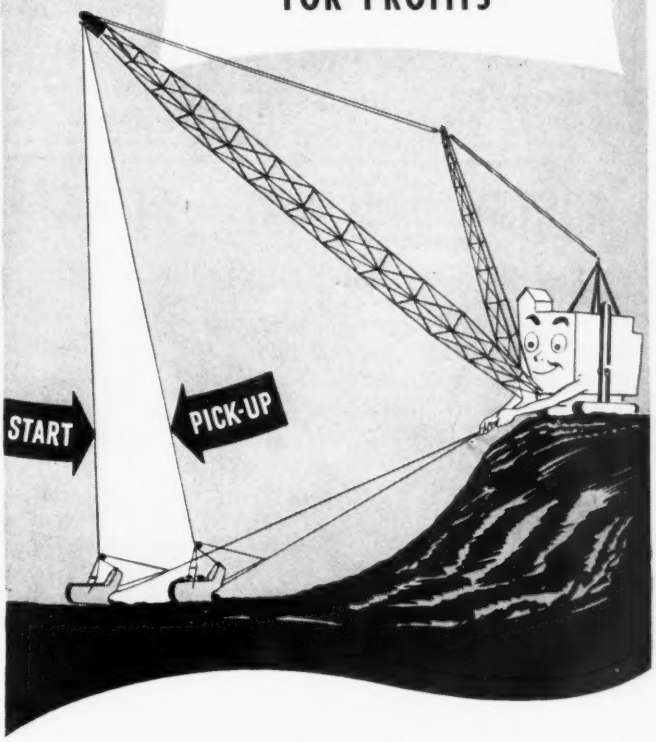

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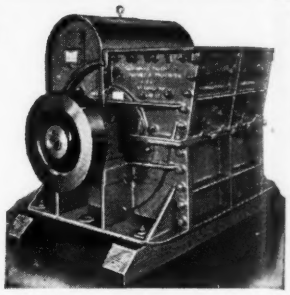
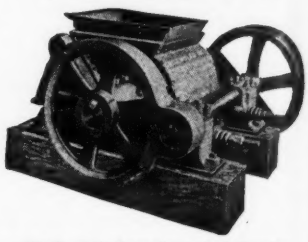


Ring Hammer Primary Crusher with patented tramp-metal catcher.



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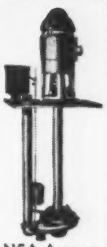

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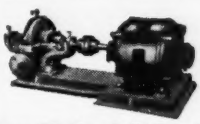
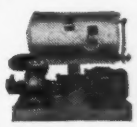
Aurora Deep Well Turbines for all conditions—4" to 24"



Type AD Hor. Split Case, Two Stage Centrifugal

Type OD Hor. Split Case Double Suction Single Stage Centrifugal



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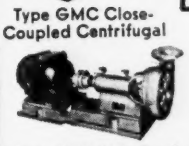

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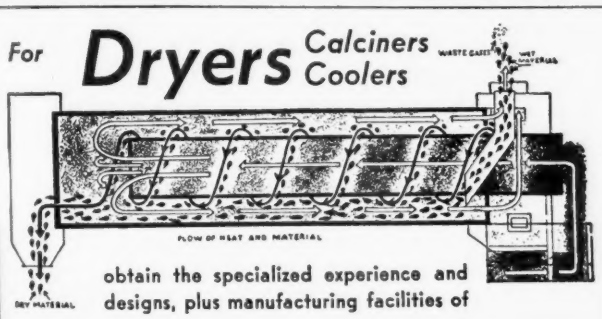

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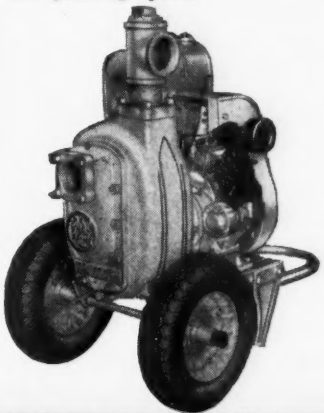
DUAL PRIMERS

When it comes to DURABILITY, CMC Dual Primers have the "guts" to stand up to those tough, steady 24-hour grinds. DUAL PRIME MEANS unmatched performance and priming speed.



A husky 3" CMC Dual Prime. One of the complete line from 1½" to 10" sizes. Also 3" and 4" Diaphragms. Get catalog.

CONSTRUCTION MACHINERY CO.
Waterloo · Iowa

MIXERS • PUMPS • HOISTS
BATCHING & PLACING EQUIPMENT
SAWS • CARTS • BARROWS

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RELEASE

UNDISPLAYED RATE:

10 cents a word, minimum charge $2.00. (See ¶ on Box Numbers.)
POSITIONS WANTED (full or part-time individual salaried employment only), ½ the above rates.
PROPOSALS, 50 cents a line an insertion.

INFORMATION:

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.
DISCOUNT OF 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

The advertising rate is $6.30 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches —to a page. C.A.

NEW ADVERTISEMENTS received by 10 A. M. May 26th will appear in the June issue subject to limitations of space available.

POSITION VACANT

ELECTRICAL FOREMAN wanted by Salt Mine. Working foreman wanted for maintenance and installation of electrical equipment, surface and underground, A.C. and D.C. 4600 to battery voltages; Varied mining, milling and material handling equipment; Excellent working conditions; Steady work with a stable industry offering good post-war prospects with generous salary to start. In reply state training, experience and salary expected. Applicant must qualify under all regulations of W.M.P.C. International Salt Co., Inc., 12841 Sanders, Detroit 25, Michigan.

POSITION WANTED

COAL PREPARATION ENGINEER, married, employed, draft exempt, several years experience in preparation of metallurgical, steam and domestic fuels. Would consider permanent connection with mining, railroad or industrial concern in executive position. PW-258, Coal Age, 520 N. Michigan Ave., Chicago 11, Ill.

BUSINESS OPPORTUNITIES

MINING ENGINEER has client who will lease and operate going coal mine with acceptable record and future possibilities. Opportunity for company seeking managerial and financial relief. BO-257, Coal Age, 520 N. Michigan Ave., Chicago 11, Ill.

WANTED CONTRACTORS with coal stripping equipment. Long profitable contract in Pa. P. O. Box 1324, Pittsburgh, Pa.

WANT DEEP MINE Contractor. Deep mine with huge tonnage and fully equipped, wants individual or corporation to contract to bring coal through tipple. Very profitable arrangement. P. O. Box 1324, Pittsburgh, Pa.

WANTED

WANT to rent or buy shovels, draglines, bulldozers and other equipment for coal stripping. P. O. Box 1324, Pittsburgh, Pa.

WANT to buy or rent coal or coke briquetting machine. P. O. Box 1324, Pittsburgh, Pa.

WANT to purchase or lease waste coke and coal piles. Must be large. P. O. Box 1324, Pittsburgh, Pa.

Will buy or lease good coal properties in West Virginia, Ohio, Penn. or Maryland or purchase entire outputs of such deep or strip mines. P. O. Box 1324, Pittsburgh, Pa.

FOR SALE

FOR SALE: Two (2) Jeffrey 29-B-Arc Wall Cutting Machines—250 Volts—48 inch gauge —each with 8-inch gooseneck. Machines have just been taken out of service and are in good running order. FS-250, Coal Age, 520 N. Michigan Ave., Chicago 11, Ill.

MOON STEAM TURBINE GENERATOR—110 V. 2160 RPM, Type 4A, Serial No. B12619A —$125.00 Cochrane Water Heater and Purifier, suitable for 150 H.P. boiler—$50.00. W. C. Hudson, Brilliant, Ohio.

One million C.M. armored, insulated, copper shaft or bore hole cable for 250 volts, direct current use. Green River Mine, South Carrollton, Ky.

WANTED

ANYTHING within reason that is wanted in the field served by Coal Age can be quickly located through bringing to the attention of thousands of man whose interest is assured because this is the business paper they read.

WANTED

PIT SUPERINTENDENT

Familiar With All Stripping Problems in Bituminous Coal. Knowledge of Operation and Maintenance of All Stripping Equipment Required, Especially 320-B Bucyrus-Erie Stripping Shovel and 50-B Loading Shovel. Location Pennsylvania. Attractive Offer Waiting for the Right Man.

P255 Coal Age
330 West 42nd St., New York 18, N. Y.

WANTED

LARGE COAL ACREAGE

Corporation will pay cash for going coal stripping operation with large coal acreage or will purchase coal acreage and strip with our equipment. (Prefer area with upwards 5 million tons). State seam and thickness, analysis, amount of coal, height and type of overburden, proximity to railroad and other pertinent data.

BO-254, Coal Age
330 West 42nd St., New York 18, N. Y.

POSTWAR POSITION
OPEN

We are looking for a YOUNG AGGRESSIVE MAN to add to our organization in sales work. Man with previous steel experience preferred. Must be willing to travel and work to develop new accounts. Please give all essential information in your reply, which will be treated confidentially.

West Virginia Steel & Mfg. Co.
Huntington, 6, West Virginia

Stainless Steel Wire Cloth

Available for immediate delivery from Milwaukee stock

117 pcs. 48" x 48" Rek-Tang stainless cloth, 10 mesh, .035" wire, slot .085" x .203".
78 pcs. 48" x 48" Rek-Tang stainless cloth, 20 mesh, .017" wire, slot .035" x .105".
39 pcs. 48" x 48" double crimped stainless cloth, ¼" square openings, .105" wire.
15 pcs. 48" x 48" flat top Superloy, 1" square openings, .223" wire.

NORDBERG MFG. CO.
Milwaukee 7, Wisconsin

WE LOOK INTO THE EARTH

By using Diamond Core Drills. We drill for Limestone, Gypsum, Talc, Fire Clay, Coal and all other minerals.

PENNSYLVANIA DRILLING CO.
Drilling Contractors
Pittsburgh, Pa.

FOR SALE

7—Sullivan H-2 Auger Drills

Slightly used

J. G. BARTHOLOMEW
311 Construction Building, Dallas 1, Texas

DIAMOND CORE DRILLING, for any mineral. More than sixty gasoline, steam and electric drills, suitable for any job. OUR SPECIALTY—testing bituminous coal lands. Satisfa[illegible] guaranteed. Prices very reasonable.

HOFFMAN BROS. DRILLING CO.
PUNXSUTAWNEY, PA. Est. 1902 Tel. 382

FOR SALE

One double deck Productive Equipment Vibrating Screen.

Excellent condition

FS-256, Coal Age
520 N. Michigan Ave., Chicago 11, Ill.

FOR SALE

2000 ACRES OF COAL

in Buchanan County, Virginia

Analyses:	
Moisture	0.65%
Volatile Matter	29.99%
Fixed Carbon	66.59%
Ash	2.86%
Sulphur	0.64%
B.T.U. Det	14,676

1200 acres in one boundary with two miles frontage on Norfolk and Western Railway. The remainder in small tracts, 50 acres and up. Price $200.00 per acre. Oil, gas and all other minerals, also timber for mining purposes and some saw timber go in on the deal.

THE ELOMAR CO., Owners
Box 276 North Tazewell, Virginia

FOR SALE

1—North West, 1¼ cubic yards gasoline model #5 shovel & drag line.
1—North West, 1 cubic yard gasoline model #105 shovel.
1—Osgood 1 cubic yard gasoline model J.M.S. shovel.

Write for particulars:

Box 187, Equity, 113 West 42d, N. Y.

FOR SALE

2 Bucyrus-Erie ¾ Cu. Yd.

MODEL B STEAM SHOVELS

In Fair Condition, at sacrifice prices. Location Pennsylvania and New Jersey.

Box 974, Equity,
113 West 42nd St., New York City

SEARCHLIGHT SECTION

ROTARY CONVERTERS

500 KW G.E. SYN. 275 V. 6 Ph., 60 Cy., 1200 RPM, Pedestal Type, 2300/4000 V., Transformers.
500 KW AL-CH SYN. 275 V. 60 Ph., 60 Cy., 1200 RPM, Pedestal Type, 2300/4000 V., Transformers.
500 KW WEST. SYN. 275 V. 6 Ph., 60 Cy., 1200 RPM, Pedestal Type, 2300/4000 V., Transformers.
300 KW G.E. SYN. 575 V. HCC, 6 Ph., 60 Cy., 1200 RPM, form P, 2300/4000 V. Transformers.
200 KW G.E. SYN. 275 V. 6 Ph., 60 Cy., 1200 RPM, Bracket Type, 2300/4000 V. Transformers.
150 KW WEST. SYN. 275 V. 6 Ph., 60 Cy., 1200 RPM, Bracket Type, 2300/4000 V. Transformers.

MOTOR GENERATORS

200 KW G.E. SYN., 275 V., 2300/4000 V., 3 Ph., 60 Cy., 1200 RPM, Manual Switchgear.
200 KW G.E. IND., 600 V., 2300/4000 V., 3 Ph., 60 Cy., 1200 RPM, Manual Switchgear.
200 KW R.W. SYN., 275 V., 2300/4000 V., 3 Ph., 60 Cy., 900 RPM, 80% P.F. Manual Switchgear.

LOCOMOTIVES

13-T WESTGHE., 250 V., 908-C Mts., 36" Ga.
13-T GOODMAN, 250 V., 36-A Mts., 36"-42" Ga.
10-T WESTGHE., 250 V., 907-C Mts., 36"-44" Ga.
10-T WESTGHE., 500 V., 907-C Mts., 36"-44" Ga.
8-T WESTGHE., 250 V., 906-C Mts., 36"-44" Ga.
8-T WESTGHE., 500 V., 906-C Mts., 36"-44" Ga.
8-T GEN. ELEC., 250 V., 839-L Mts., 36"-48" Ga.
6-T WESTGHE., 250 V., 904-C Mts., 36"-48" Ga.
5-T ATLAS, 250 V., 823-A Mts., 36"-42" Ga.

Each unit listed above is owned by us and is available now for immediate purchase.

WALLACE E. KIRK COMPANY
Incorporated
501 Grant Building Pittsburgh, Pa.

SPOT CASH

For complete mines that are going out of business or from receivers in bankruptcy, administrators of estates, etc.

Frank J. Wolfe

FOR SALE

LOCOMOTIVES

2—15-ton Goodman
1—15-ton Jeffrey
1—15-ton Westinghouse
2—10-ton Goodman
2—8-ton Goodman
2—8-ton G. E.
3—8-ton Jeffrey
3—6-ton Goodman
5—6-ton G. E.

ABOVE LOCOMOTIVES COMPLETELY REBUILT

ELECTRIC HOISTS

1—1300 H.P. Double Drum, cylindro-conical drum, 900' of 1¼" rope, 2300 volt.

1—500 H.P. Double Drum, 1600' of 1¼" rope, 2300 volt, Ward-Leonard Control.

1—400 H.P. Slope Hoist, 8500' of 1" rope.

MISCELLANEOUS

2—Joy Elevating Conveyors for loading from conveyors into mine cars.
Motor Generator Sets
Rotary Converters
4—Practically new Jeffrey 24-B Longwall Machines, 250 volt DC. Used only a few months.
Steel Tipples.
3—Practically new L-400 Jeffrey Loading machines, 250 Volt DC just taken out of service.

Mail Us Your Inquiries!

COAL MINE EQUIPMENT SALES COMPANY
306-7 BEASLEY BUILDING L.D. Phone-34 Terre Haute, Indiana

FOR SALE

1—One **NORDBERG Hoist** No. 06392, 4 ft. drum, hydraulic brake direct connected 150 h.p., G.E. motor AC, 440 v. 3 ph. 60 cycle, speed 585, complete with panel board and ammeter.

3—One **POMONA Vertical Pump,** 75 h.p., AC, 250 v. 60 cy. 3 ph. Westinghouse motor, together with starting compensator, capacity 1000 gal. per min., 200 feet head.

4—One **ALLIS CHALMERS Pump,** type BS 13406, 100 h.p., motor AC, 200 v. 60 cy., 3 ph., capacity 1000 gal. per min., 250 feet head.

All of the above equipment in first class operating condition

FS-200, Coal Age
520 No. Michigan Ave., Chicago, Ill.

COMPRESSORS

526 CFM Ingersoll-Rand, Style "JC"
940 CFM Ingersoll-Rand 10 horiz. 3-st. steam driven with receiver

CRUSHERS

24" x 54" Superior Crushing Rolls
#3 McCully Gyratory
#6 McCully Gyratory

HOIST MOTORS

1—20 H.P. Northern G.E. Type 220 V D.C. 1000 RPM, complete with drum controller
1—22 H.P. G. E. Type ITC 5011, 720 RPM, 3/60/440
2—37 H.P. Otis Elevator, Type 90219, 1140 RPM, 3/60/440
4—40 H.P. G.E. Type MTC 5522, 1200 RPM, 3/60/440
1—50 H.P. Thomas Elevator, Type 1-12-35, Form M 600 RPM, 3/60/440
1—100 H.P. Northern G. E. Type, 220 V D.C., 475 RPM, complete with drum controller
8—American Hoist & Derrick Co. double drum, motor driven with 40 H.P. A.C. motors

IRON & STEEL PRODUCTS, INC.
13484 S. Brainard Ave., Chicago 33, Illinois
"Anything containing IRON or STEEL"

MINING MACHINES

AC & DC

REBUILT & GUARANTEED FOR IMMEDIATE SHIPMENT

New Electric Coal Drills for AC and DC
Mine Fans, Tipple Scales, etc.

Equipment of all kinds

Buy, Sell or Exchange

THE INDUSTRIAL EQUIPMENT CORP.
Warehouse: Carnegie, Pa.
P. O. Box 1647 Pittsburgh, Pa.

WANTED TO BUY FOR CASH

Seven (or less) #35-BB Jeffrey 44" ga., 250 volt DC Mining Machines complete.

W-259, Coal Age
520 N. Michigan Ave., Chicago 11, Ill.

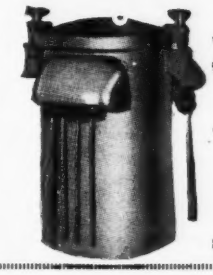
WANTED

WANTED

¾ to 4 yard
SHOVELS
2 to 8 yard
DRAGLINES

FRANK SWABB EQUIPMENT COMPANY
Hazleton, Pa. Telephone 3906

—TRANSFORMERS—



BOUGHT and SOLD

We have several thousand transformers in stock for prompt shipment, and invite your inquiries.

PIONEER TRANSFORMER REBUILDERS

We rewind, repair and redesign all makes and sizes.

One Year Guarantee

THE ELECTRIC SERVICE CO., INC.
"AMERICA'S USED TRANSFORMER CLEARING HOUSE"
STATION M Since 1912 CINCINNATI 27, OHIO

PROMPT SHIPMENT FROM OUR WAREHOUSE

MINING MACHINES

4—12 DA 50 HP 250 v. Goodman Shortwall
36 B Jeffrey 250 v. Low Vein #14318
CE 7 Sullivan 250 v. DC

STORAGE BATTERY LOCOMOTIVES

2—6 Ton G.E. Permissible Locomotives 36/44" Ga. O.S. armorplate frame. Inside steel tired wheels, 2-HM 825 Ball Bearing Motors. Type LSBE Class 2C6 From C9. 13½' long, 50" high, 69" wide and 44" Wheel base.

Each of the above units equipped with Edison Battery 80 cell A-10—one new in 1940, the other in 1939.

3—5 to 5½ Ton Type D Ironton, 36 or 42" Ga. Low Type.
1—4 Ton Jeffrey 42 or 44" Ga. with 2 MH 108 Ball Bearing Motors, Battery Box on top of locomotive.
1—5 Ton Atlas 40" or 44" Ga. with 2 Ball Bearing Motors. Battery box on top of locomotive.
1—5½ Ton Jeffrey 36" Ga. with 49 cell 23 plate New Exide Ironclad Battery.
4 Ton 36" Ga. Atlas.

(Haulage)

10 Ton Jeffrey with 13 Ton Equipment O. S. armorplate frame, inside new steel tires, 2 MH 110 Ball Bearing Motors, 36/42" Ga. completely rebuilt.
13 Ton Westgh. 250 V. 36" or 40" Ga.
1—5 Ton West. 250 V. 36 or 42" Ga. with Electric Gathering Reels. Bar steel frame.

SCREENS

2—4' x 5' single deck Tyler Hummer Screens Type 37 equipped with V-16 Vibrators No. 2860 and 2867 designed for 110 v. AC 15 cy.

MG SETS 3 ph. 60 cy. (Syn.)

150 KW G.E. 250 v. —2200/3/60 900 RPM.
150 KW Ridgway 250 V. DC 2200 V. AC 900 RPM.
100 KW Ridgway 250 V. DC—2200 V. AC 1200 RPM.
75 KW 250 v. G.E. Type DLC G.E. opd. wd. interpole Gen. dir. con. to G.E. 100 HP Induction Motor 220 or 440 v. 3 ph. 60 cy. 1160 RPM with Starter and DC Panel.

AIR COMPRESSORS

492 cu. ft. 100#C hg. Pneumatic straight line heavy duty Diesel oil driven Compressor unit.

ENGINE GENERATOR SETS

100 KW 250 V. DC Westgh.—Skinner Engine.
50 KW West. 125 V. DC—Skinner Engine.
25 KW Westinghouse 125 V. Steam Turbine.

SLIP RING & SQ. CG. MOTORS (3 ph. 60 cy.)

HP	Make	Speed	Wdg.	Type
500	G.E.	450	S.R.	MT 412
200	G.E.	250	S.R.	MT 412
200	G.E.	600	S.R.	I-M
150	G.E.	600	S.R.	I-M
125	Al. Ch.	435	S.R.	
100	G.E.	500	S.R.	MI-25 cy.
100	Al. Ch.	575	S.R.	
100	West.	900	S.R.	CW.
100	G.E.	1200	S.C.	

PUMPS

250 GPM 250# or 575' Head 2 cyl. Hor. National Transit 6" suc. 4" dis. enclosed driven by 40 HP Motor.

HOISTS

1500 HP Shaft hoist including flywheel MG set operated on 2200 volt 3 phase 60 cycle
500 HP Connellsville Sgl. drum slope Hoist complete with AC Motor and contactor control.
75 HP Lidgerwood sgl. fr. drum
50 HP Diamond 2 drums same Shaft
52 HP American 2 drum, AC Motor
30 HP Clyde sgl. drum AC Motor
30 HP Double drum—Tandem
15 HP Lidgerwood sgl. dr. AC Motor

400 TRANSFORMERS (Westgh. & GE 1 ph.)

Qu.	KVA	Pri. V.	Sec. V.
40	5	2080/2200	115/230
31	7½	"	"
28	10	"	"
2	25	2200	244/488
3	50	22000	2200
3	75	2200	110/220
3	75	2200	220/440
3	100	2200	220/440

AC AIR BREAKERS (unused)

8—200/400 amp. 3 pole ITE 220 v.
2—300/600 amp. 3 pole ITE 220 v.

COAL CRUSHERS

24" x 30" Penna. single roll Heavy duty coal crusher.
18" x 24" Double roll New.
18" x 30" Double roll New.

SYNCHRONOUS MOTORS

HP	Make	Voltage	Speed	Type
220	G.E.	2200	600	ATI
200	West.	2200	900	
150	G.E.	2200	900	ATI

Each of the above has a dir. con. exciter.

MOORHEAD-REITMEYER CO., INC.

PITTSBURGH, PENNSYLVANIA

ELECTRIC LOCOMOTIVES

1—20 T. West. Diesel Elec. Std. gauge.
1—13 T. G. E. with HM-829 250 V motors.
1—10 T. G. E. with HM-830 250 V motors.
1—10 T. G. E. with HM-830 500 V motors.
1— 8 T. Goodman steel frame, 250 V Type 31-0-4-T.
1— 6 T. Jeffrey, MH-88 250 V motors & reels.
1— 5 T. G. E. ready to operate.
1— 3 T. Jeffrey, MH-96 250 V motors.

COAL CUTTING MACHINES

1—29LE Jeffrey 250 V, T.O.H.
1—12AB Goodman S.W. 250 V. D.C.
1—12DA Goodman, 50 HP, 210 V. D.C.
1—12G3 Goodman S.W. 3/60/220 V.
2—124EJ Goodman Slabbers, 250 V. D.C.
1—29C Jeffrey 250 V. Arcwall.

MOTORS AND GENERATORS

1—100 KW West. cp. wd. D.C. Generator, 250 V.
1—100 KW Rotary Converter, 275 V. D.C. with transformers.
1—600 HP Allis-Chalmers Syn. 3/60/2200 V.
1—165 HP G. E. Syn. same.
1—100 HP Crocker-Wheeler Syn. same, except 220 V.
1—15 HP G. E. B/B, 3/60/220/440 V.
1—7½ HP West. same.
1—15 HP Allis-Chalmers, 3/60/220/440 V.
1— 5 HP same.
1— 2 HP Century, single phase.

Send us a list of any equipment you may have for sale.

TIPPINS MACHINERY COMPANY

Pittsburgh 13, Pa.

MINE EQUIPMENT

6600, 2200 & 440 Volt Transformers
50 Hp Lidgerwood Double Drum Hoist
R113 Mine Locomotive Controllers
2700 GPM Synch. Mtr. Driven Pumps
350 HP 3/60/2200 V Weco S.R. Motor
250 HP 3/60/2200 V Weco S.R. Motor
200 HP 3/60/2200 V Geco S.R. Motor
Large Stock—A.C. & D.C. Motors
Switchboards Built to Order

John D. Crawbuck Co. Zone 22 Pittsburgh, Pa.

FOR SALE

Conway Mucker "75", 36" gauge
2—Conway Muckers "50", 36" ga. rebuilt
Buc. Erie 50B Steam Shovel-Crane, 2 yds.
Marion Model 37 Steam Shovel, 1¾ yds.
Bay City 20 Gas Shovel, ⅜ yds., rebuilt
Koehring 301, ¾ yd. Shovel & Crane
Lorain 30 Shovel, Crane & Backhoe
P & H Model 600 Shovel and Crane
Buc. Erie Steam Dragline, 6-8 yds. 175' bm.
Moore Speedcrane 15 tons, gas, 63' boom
Speeder ½ yd. Backhoe
Bay City ½ yd. Shovel
Marion Model 32 Steam Shovel, 1½ yds.
Ind. Brownhoist Crane, gas, 40' boom 1 yd.
Brownhoist Loco. Crane 35 tons, steam
Allis Chalmers "L" Tractor with bulldozer
Allis Chalmers "LO" Tractor with bulldozer
Cletrac FD Tractor with Bulldozer & Scraper
Cletrac FD Tractor with Hell 12 yd. Scraper & Bulldozer
Cletrac FD Tractor with 12 yd. Hell Scraper
Scraper-Wagon, Hell 12 yard
TD9 Tractor with bulldozer
Allis Chalmers "30" Tractor with bulldozer
Mundy 35 H.P. double drum gas Hoist
Stroudsburg 25 H.P. double drum gas hoist
National 100 H.P. dbl. drum Dragline Hoist, elec.
American 75 ton Locomotive, steam. Rebuilt
American 50 ton Saddle Tank Switcher
American 45 ton Saddle Tank Switcher
Vulcan 30 ton Steam, std. gauge Saddle Tank loco.
Vulcan 25 ton Steam, std. gauge Locomotive, side tank
Vulcan 20 ton Gas, std. gauge Locomotive, rebuilt
Whitcomb 14 ton, 36" gauge Diesel Loco.
Davenport 10 ton, std. gauge, gas Loco.
Vulcan 8 ton, std. gauge, gas Loco.
Vulcan 6 ton, 36" gauge, gas Locomotive
Steel Storage Bin 200 tons, ¾" plating
I. R. 1302 CFM., 2 stage Air Compressor
I. R. 1050 CFM., 2 stage Compressor, gas drive
Bucket elevator, belt, 22", buckets, 35'
Hayward 1 yd. Clam, rehandling Bucket
Haiss ¾ yd. Clam, rehandling Bucket
Erie ¾ yd. Clam, rehandling Bucket
Blaw-Knox ⅞ yd. Clam, digging Bucket
Hayward ⅞ yd. Clam, digging Bucket

RICHARD P. WALSH CO.

30 Church St. New York 7, N. Y.

ELECTRIC EQUIPMENT CO.
63 CURLEW ST. • P.O. BOX 51
ROCHESTER 1, NEW YORK

NEW AND REBUILT

1—220 HP. Sterling gasoline engine 120 KW. 550 volt DC generator, also available 250 volt DC, or AC.

ELECTRIC EQUIPMENT COMPANY

63 Curlew St. Rochester, N. Y.

MINE HOISTS

1—Ottumwa Band Friction 36" will coil 3500 ft. ⅞" rope. 125 HP Motor.
1—Lidgerwood Cone Friction 42" will coil 2500 ft. ⅞" rope. 100 HP Motor.
1—Vulcan Band Friction Two Drum 54" 150 HP Motor.
1—Flory-Keyed Drum 52" will coil 2000 ft. 1" rope. 150 HP Motor.
1—Vulcan Sliding Pinion 60" will coil 3500 ft. 1" rope. 200 HP Motor.
1—Lidgerwood-Cylindro Conical Shaft Hoist—275 ft. 1¼" rope. 300 HP Motor.
1—Vulcan-Cylindro Conical Shaft Hoist 350 ft. 1⅜" rope. 400 HP Motor.
1—Connellsville-Cylindro Conical Shaft Hoist 350 ft. 1½" rope. 800 HP Motor.

And other hoists to suit all mining conditions

Jones Mining Equipment Co.

541 Wood Street Pittsburgh, Pa.

FOR SALE

STEEL TANKS—STEEL BUILDINGS

All sizes and kinds
Guaranteed used steel pipe
Valves and fittings
All items at various points

JOS. GREENSPON'S SON PIPE CORP.
Natl. Stock Yds., St. Clair Co., Ill.

IRON and STEEL PIPE

New and Used

Large stocks, all sizes attractive prices

L. B. FOSTER COMPANY

P. O. Box 1647 Pittsburgh 30, Pa.

PIPE—MACHINERY—GAS ENGINES
AIR COMPRESSORS—DIESELS—PUMPS

Some Steam Engines and Boilers available only slightly above the metal price

BRADFORD SUPPLY COMPANY

WAYNE, WOOD COUNTY, OHIO Near Toledo

TO HELP YOU . . .

find equipment you need

"Searchlight" Advertising

6 YD. or 8 YD. STRIPPER SHOVEL

225 Bucyrus 80 ft. Boom, 54 ft. Dipper Stick, Steam Shovel.

2-4 Yds. SHOVELS

2 Marion Model, 125, Electric, 35' Boom. 25' Dipper Sticks

16 YD. DRAGLINE:
1—16 Yd. Electric Caterpillar Modern Dragline with 160' Boom

AIR COMPRESSORS:
(7) Steam 66 ft., 300 ft., 600, 1000 & 1940 ft.
(12") Belted, 360, 676, 870, 10000, 1300 ft.
(12) Diesel 105, 315, 520, 676 & 1000 ft.
(6) Electric, 1300, 1500, 2200, 2000, 5000 ft.
(14) Gasoline, 10, 160, 220, 310 & 370 ft.

RUBBER CONVEYOR BELTS:
1000' 60", 600' 30", 300' 20", 1000' 42", 900' 48", 1450' 36", 1200' 24", 900' 18", 600' 16", 350' 14".

TANKS:
12,000 and 15,000 gal. and 20,000 gal.

CONVEYOR PARTS:
Idlers, Heads & Tail Pulleys, Steel Frames, Tripper, etc., 14 In., 6 In. Large stock here.

STORAGE BATTERY LOCOMOTIVES:
2½ ton Witcomb 24 ga. New Batteries
2—4 ton G.E. 30 in. ga.
3—5 ton Mancha 30 in. ga.
4—5 ton G.E. 36 in. ga.
3—7 ton Goodman 36 ga. Battery & Trolley
8—6 ton Baldwin Westgh. 42 ga. & 36 ga.

TRACK SCALE:
150 Ton Buffalo 56 ft. R.R. Track Scale

TROLLEY LOCOMOTIVES:
2½ ton Westinghouse 24 ga.
4—6 ton & 3—5 ton Goodman 36 ga.
3—6 ton Goodman 30 ga.
4—6 ton Goodman 42 ga.
5—6 ton Westinghouse 42 ga.
2—8 ton Goodman 36 ga.
10 ton Goodman 42 ga. & 12 ton Jeffrey

VIBRATING SCREENS:
2 Tyler Hummer 3x6,4x5, 4x8 & 4x10
2 Robins Gyrex 4x8½
4x12 Niagara, 3x8 L. B., 5x6 Simplex

CARS:
60—Western 16-20-30 yd. Side Dump

SHOVELS, CRANES & DRAGLINES:
1 yd. K 30 Link Belt 50' Boom Crane
2 yd. Page 70' Boom Diesel Dragline
1¼ yd. Marion 450 Elec. Shovel
1½ yd. Lima Diesel Shovel & Dragline
25 ton Browning 50' Boom Loco. Crane

MINE LOADERS:
Junior Joy 36 ga. Low Pan
3—5 BU & 7 BU & 12 BU 36 or 42 ga. Joy
7 Conway 20A, 30A, 50A, 60 & 75 Muckers

MISCELLANEOUS:
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Clamshell Buckets ¾ ; 1, 1½ & 2 yd. Cap.
30 ton & 12 ton Vulcan St. Ga. Gas. Loco.

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Complete Mines—M.G. Sets, Locomotives, Compressors, Conveyors, Cranes, Crushers, Mine Loaders

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Lambert Hoist, 30"x39" with 5" flange with 40 h.p. G. E. slip ring motor complete. 220 volts, 3 phase, 60 cycle, 1125 RPM with V belt drive.

Lambert double drum hoist, 19"x26"—5" flange loose drum, with 40 h.p. G. E. slip ring motor, 220 volts, 3 phase, 60 cycle, 1125 RPM with V belt drive. This hoist can be used with one drum

1—Model H. G. Brownie Hoist without motor. This hoist used only sixty days.

1—350 h.p. G. E. slip ring motor, 2200 volts, 3 phase, 60 cycle.

1—150 h.p. Allis Chalmers 2200 volt slip ring motor, 3 phase, 60 cycle with V belt drive.

1—300 h.p. Waukeshaw gas engine direct connected to 100 k.w. 2200 volt Generator.

1—Jeffrey fan, 11'x5'6" V belt drive.

1—Jeffrey Fan, 6'x3'.
(Both reversible with steel duct and connected to motors listed above.)

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Width	Ply	Top-Bottom	Covers	Width	Ply	Top-Bottom	Covers
48"	8	1/8"	1/16"	20"	5	1/8"	1/32"
42"	5	1/8"	1/16"	20"	4	1/8"	1/32"
36"	6	1/8"	1/16"	18"	4	1/8"	1/32"
30"	6	1/8"	1/16"	16"	4	1/8"	1/32"
30"	5	1/8"	1/16"	14"	4	1/16"	1/32"
24"	5	1/8"	1/32"	12"	4	1/16"	1/32"
24"	4	1/8"	1/32"				

Inquire For Prices - Mention Size and Lengths

TRANSMISSION BELTING

HEAVY-DUTY FRICTION SURFACE

Width	Ply	Width	Ply	Width	Ply
18"	6	10"	6	6"	5
16"	6	10"	5	5"	5
14"	6	8"	6	4"	5
12"	6	8"	5	4"	4
12"	5	6"	6	3"	4

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"B" WIDTH All Sizes | "E" WIDTH All Sizes
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	25 "	13.00
1½"	50 "	20.00
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Specify Thread On Couplings

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I.D. Size	Length	per Length
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	25 "	6.25
1¼"	50 "	12.00
	25 "	7.50
	35 "	10.50
	40 "	12.00
1½"	50 "	15.00
	25 "	10.00
	35 "	14.00
	50 "	20.00

AIR HOSE

I.D. Size	Length	per Length	Couplings
½"	25 feet	$5.00	$1.50 Pair
	50 "	10.00	1.50 "
¾"	25 "	6.25	2.50 "
	50 "	12.50	2.50 "
1"	25 "	10.00	3.50 "
	50 "	20.00	3.50 "

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1—10 ton, 31-1-4-T.
1— 6 ton, 30B, 43" 1—5 ton.
1— 5 ton, W-1-2, 36".
2— 4 ton, 2600 K.
1— 6 ton, 33-1-4-T.
2— 8 ton, 32-1-4-T.

Westinghouse: All 250 volt.
1—4 ton, 902, 48" 1—13 ton, 102, 42"
1—904 c. 44" 500 volt. Also 906 motors.
1—10 ton, 915.

G.E.: All 250 volt. 4 ton 1022, 44", as is
6 ton 803, 44", as is 5 ton 825, 44"
6 ton 823, 44" 8 ton 839 motors
6 ton 801
8 ton 839

Jeffrey: 6 ton, and 4 ton, all gauges, 250 volt
1—**Jeffrey** MH 100, frame only.

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Jeffrey, 35B and 4—28A, 250 V. 4—29B.
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1—12G3 250 volt and 2—112 DA, 500 volt.
2—Permissible Type 12CA. 6—112AA,
3—124AA.
Sullivan, CE7, CE9, CE10, CR10 Low Vein.
CR5 for middle cutting.

SUBSTATIONS—275 volts, D. C.

2—200 KW **G.E. Rotaries** (600 volt)
1—200 KW **Ridgway** M.G. Set.
1—200 KW **G.E.** Rotary Converter.
1—200 KW **West.** Rotary.
1—150 KW **West.** Rotary.
1—200 KW 1—100 K **Ridgway** M-G Sets.
1—150 KW **Ridgway** Rotary.
1—150 KW **West.** Rotary-converter.
1—100 KW **West.** M-G Sets.

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26"x16' Pittsburgh, 3 S.C.D. Q.C.

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1—12 A'A Goodman 250 v. 36" ga.

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5—5 ton Goodman 30 B, 250 v. 36" ga.
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2—7 ton Goodman 32-0-4-T 250 v. 36" ga.
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1—10 ton West. 500 v. 40" ga.
1—12 ton G.E.-53 500/550 v. 42" ga.

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1—75 KW, 250 v. DC, type SK Westg Gen. belted to 100 HP Buckeye Horiz. Diesel Engine, complete with swb.

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3	100	6600	550/440/220	Pgh.
3	50	11430/6600	550	Al. Ch.
3	50	6600	575	G.E.
3	50	Westg.	4000/2200	230/460
1	37½	2300	220/440	Wagner
3	37	4400	185	West. (Rotary)
35	10	2200	110/220	G.E.
100	7½	2200	110/220	G.E.
75	5	2200	110/220	West.

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HP	Make	Type	Volts	RPM
300	Westg.	CW-1106	2200	580
250	Westg.	CW	2200	345
100	G.E.	I	220	450
100	Westg.	CI	220/440	1750
75	Cr. Wh.		220/440	875
60	Triumph	C-16	220/440	430
60	Westg.	HF	2200	690
53	G.E.	I	220/550	1165

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2—1000 G.P.M. Cameron bronze, 100' hd. 8 x 8.
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HP	Make	RPM	Type
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35	Westg.	675	SK-140
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300	Otis	550	———

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1—Model 100 P & H ⅝ yard Shovel. Gas powered. Rebuilt.
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1—29-B Jeffrey arcwall, 250 volt, top cutter
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2—CE-7 Sullivan shortwall, 250 or 500 volt
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1—13-Ton Westinghouse, type 79, 250 volt, 48" gage
1—6-Ton Ironton, 250 volt, low vein with cable reel
1—4-Ton Jeffrey MH-96, 250 volt, 42 to 48" ga. with reels

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75—KW. West. M-G Set complete, 2300 volt Sync. motor 275 volt Generator
200—KW. G. E. Rotary converter comp. 2300 volt A.C. 275 volt D.C. type TC-6
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35-HP. Ottumwa, single drum, will spool 2300' of ⅝" rope

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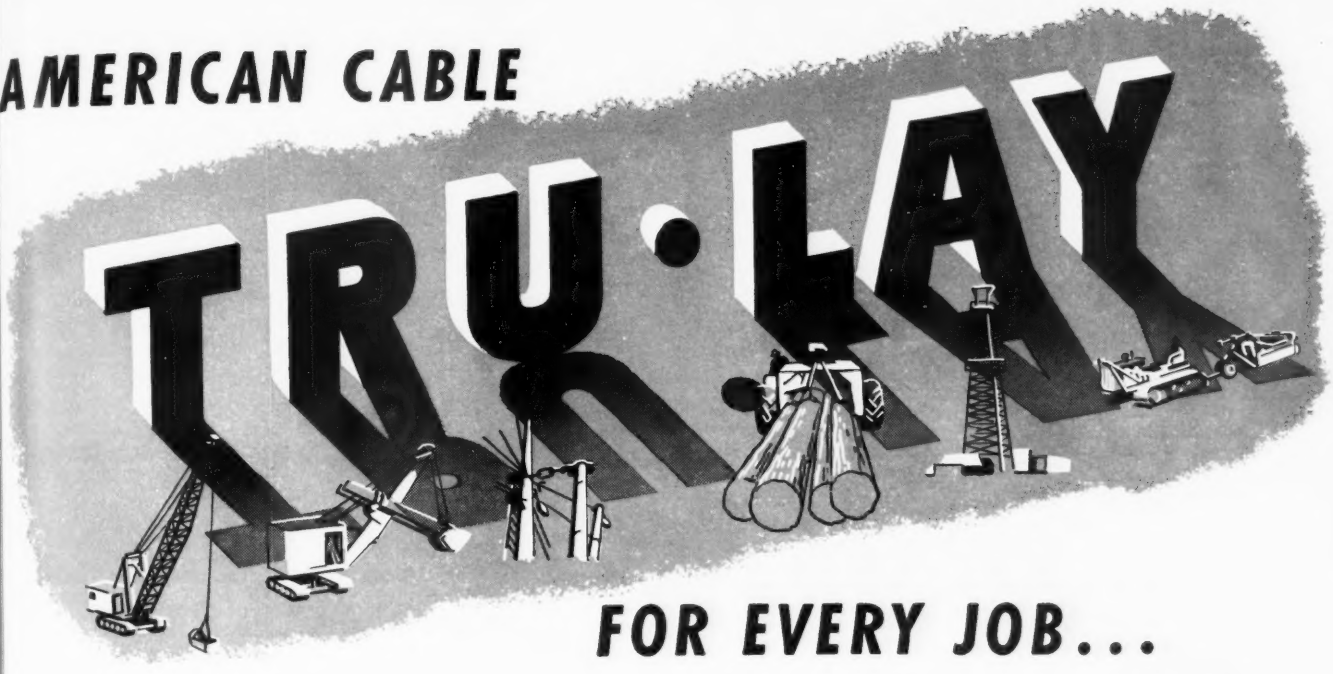

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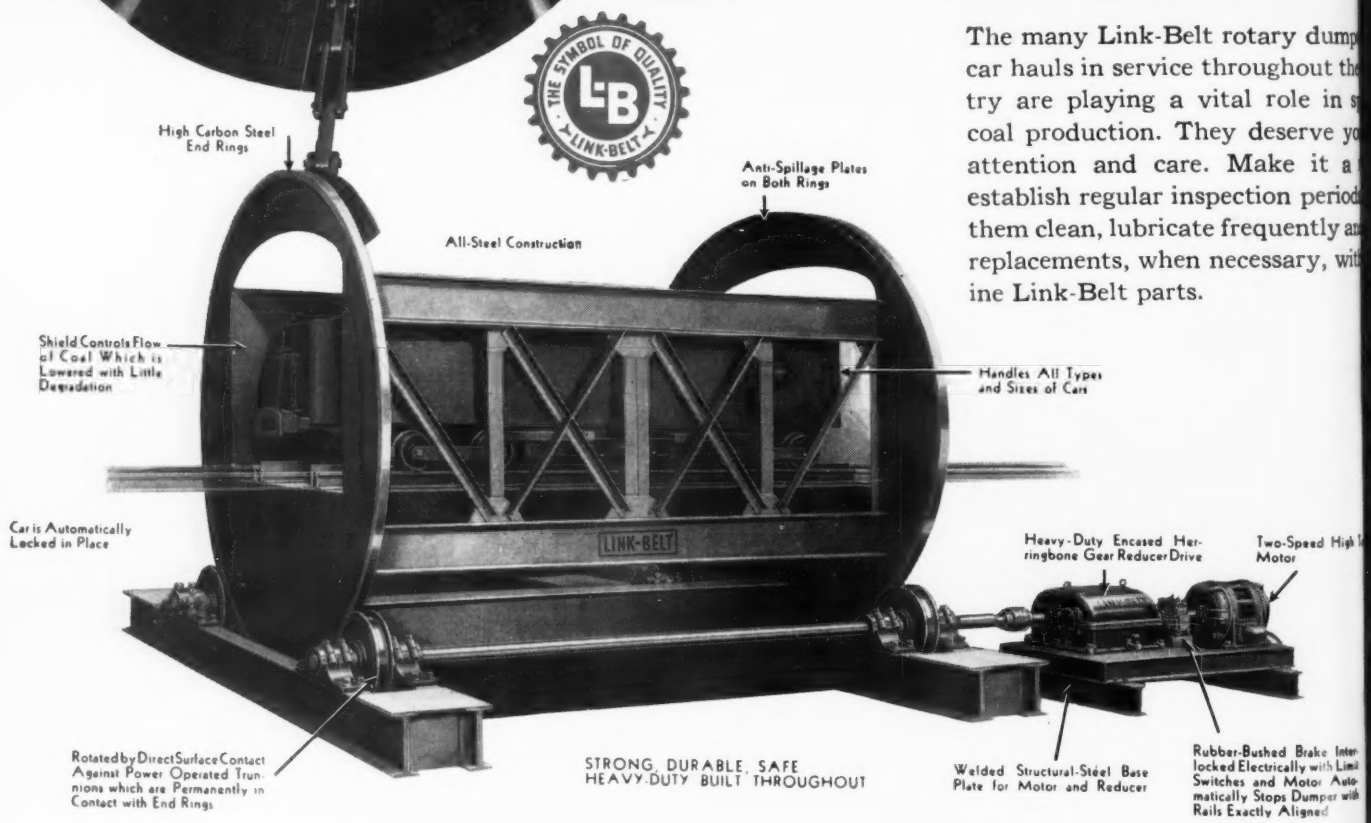
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